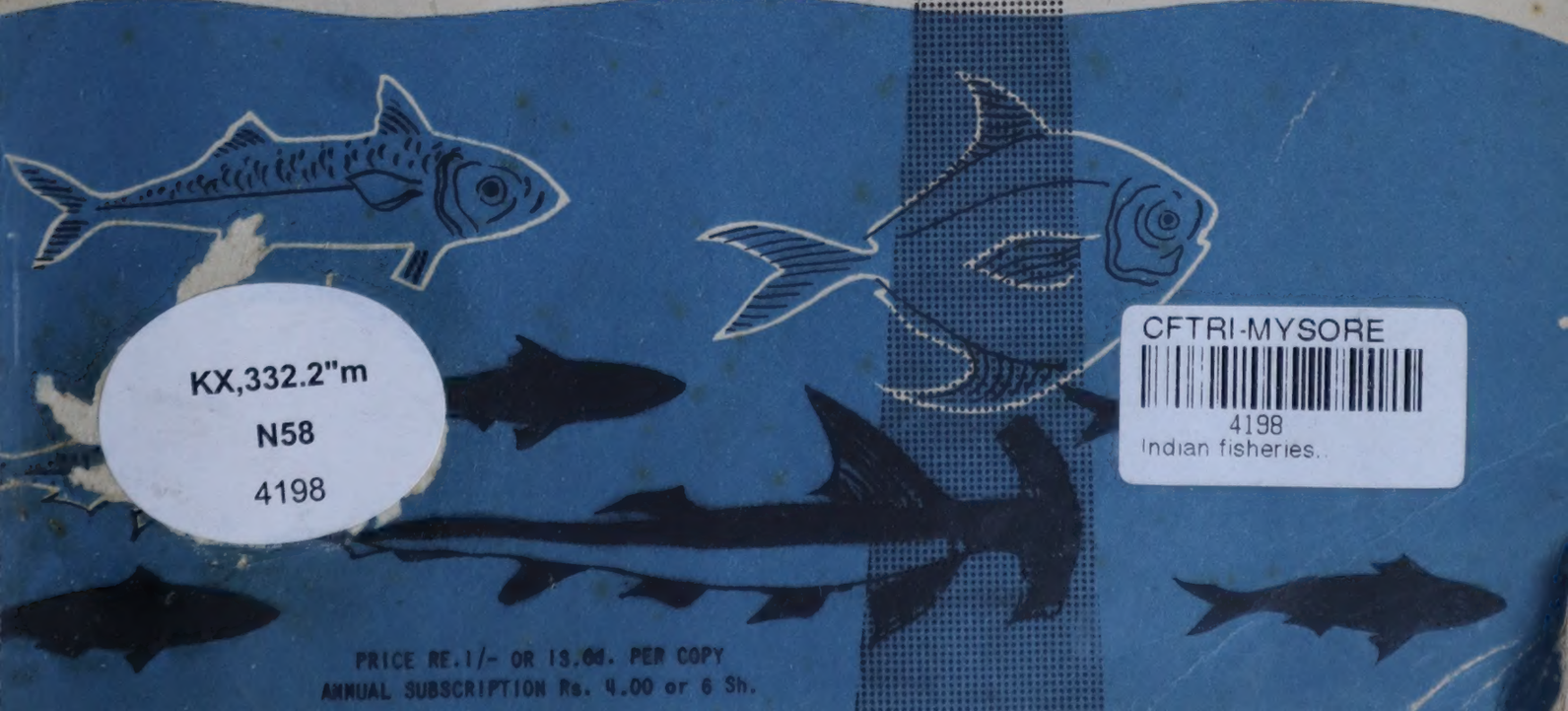
VOL. V NO 4 • OCT., 1958

P.Agr.59.4.58(N)
1500

INDIAN FISHERIES BULLETIN

CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE
22.2.1960
LIBRARY
MYSORE.



KX,332.2"m
N58
4198

CFTRI-MYSORE
4198
Indian fisheries.

PRICE RE.1/- OR 1S.6d. PER COPY
ANNUAL SUBSCRIPTION Rs. 4.00 or 6 Sh.

P. Agr. 59-4-58 (N)
400

INDIAN FISHERIES BULLETIN

Volume V, No. 4

October, 1958

CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE
22.2.60
LIBRARY
MYSORE.

Issued by
GOVERNMENT OF INDIA
MINISTRY OF FOOD AND AGRICULTURE
(AGRICULTURE)

Price Re. 1.00 or 1sh. 6d. per copy.

193 Food and Agri—1

4198 ✓

Kx, 332.2 "m
N58

CFTRI-MYSORE
4198
Indian fisheries...

CONTENTS

A—INDIAN

I. General and Development 1
(1) Marine 1
(2) Inland 11
(3) Technology 16
(4) Trade 17
(5) Socio-economics 20
(6) Conservation & management . . . . . —

II. Marine Fisheries Research 20
(1) Fishery Biology 23
(2) Hydrobiology . . . . . —
(3) Fishing gear & craft . . . . . —

III. Inland Fisheries Research 25
(1) Fishery Biology 27
(2) Hydrobiology . . . . . —
(3) Fishing gear & craft . . . . . —

IV. Fish Preservation . . . . . —
(1) Curing . . . . . —
(2) Pickling . . . . . —
(3) Salting . . . . . —
(4) Drying . . . . . —
(5) Refrigeration . . . . . —

V. Fish Products . . . . . —
(1) Fish meal . . . . . —
(2) Fish oil . . . . . —
(3) Fish manure . . . . . —

B—FOREIGN

I. General and Development 28
(1) Marine 28
(2) Inland 33
(3) Technology 33
(4) Trade . . . . . —
(5) Socio-economics . . . . . —
(6) Conservation & management . . . . . —

II. Marine Fisheries Reserarch . . . . . —
(1) Fishery Biology . . . . . —
(2) Hydrobiology . . . . . —
(3) Fishing gear & craft . . . . . —

III. Inland Fisheries Research . . . . . —
(1) Fishery Biology . . . . . —
(2) Hydrobiology . . . . . —
(3) Fishing gear & craft . . . . . —

IV. Fish Preservation 35
(1) Curing . . . . . —
(2) Pickling . . . . . —
(3) Canning . . . . . —
(4) Salting . . . . . —
(5) Drying . . . . . —
(6) Refrigeration . . . . . —

V. Fish Products 36
(1) Fish meal 36
(2) Fish oil . . . . . —
(3) Fish manure . . . . . —

C—GENERAL FISHERY NEWS 37

INDIAN

GENERAL AND DEVELOPMENT

Recommendations of the Conference of State Ministers for Fisheries held at Mysore on the 14th, 15th and 16th July, 1958.

A. Administration and Organisation

The Conference having considered administrative actions necessary for improving inland fisheries recommends that:—

1. State Governments should set up separate Directorates of Fisheries under technical Officers.

2. The Fisheries Departments should be considered primarily as Development Departments responsible for developing fisheries, application of research, carrying out research and for technical and scientific guidance and execution.

3. The terms and conditions of service in Fisheries Department in a State should be the same as in corresponding development Departments in the State.

4. The Fisheries Department and its personnel should be made permanent in the same manner as other Development Departments.

5. For the purpose of ensuring effectiveness and uniformity, a suitable draft Bill meeting the requirements of fishery development and administration be drawn up by the Ministry of Food & Agriculture and circulated to States for their consideration and adoption.

6. Departments of Government other than Fisheries be requested to transfer such areas which harbour spawn and fingerlings to the management of the Fisheries Department in order to enable them to augment fish seed production.

7. (a) The fisheries in rivers, tanks, lakes, jheels, etc., either under the control of the States, local bodies or Gram Panchayats, should be leased out, as far as possible, to fishermen co-operative societies or co-operatives or agricultural organisation on the basis of average realisations of the past few years without putting them to public auction. The lease amounts in natural fisheries, not specially stocked, may be based on average realisations of the past few years (preferably 3 to 5). In case of fisheries specially stocked, the lease-amounts should be fixed on the production potential of the waters in consultation with the Fisheries Departments.

(b) The fisheries rights in all the public waters, excepting those vested with the Village Panchayats, or other Local Bodies, should vest with the Department of Fisheries for necessary development and exploitation.

(c) The State Governments may consider acquisition of fisheries rights where owing to multiple ownership, the development of fisheries is being hampered.

8. A representative of the State Fishery Department should be included in the Development Board constituted for the administration of the River Valley Projects. Where such a Board does not exist, the development and administration of fisheries should be entrusted to the State Fisheries Department. Fishery development in all aspects should form an essential charge on the budget of the concerned project.

9. For the purpose of ensuring maximum results in fisheries from the reservoirs of River Valley Projects and other major irrigation projects, adequate provision should be made for removal of obstructions.

10. The Fisheries Departments should be represented on the Board or Committees in the States dealing with the subject of water pollution.

11. For effective co-ordination in fisheries development, a representative of the State Fisheries Department should invariably be included in the State Development Board under the Chairmanship of the Chief Secretary or the State Development Commissioner.

12. Necessary foreign exchange may be made available for the purchase of fishing gear, ice plant, cold storage and other requisites of fishing industry. Such equipment, where un-obtainable in India, may be exempted from customs duty or alternatively subsidy to cover customs duty may be sanctioned.

B. Inland Fisheries Surveys and Fish Production

The Conference having considered in detail the various aspects connected with inland fishery surveys and fish production recommends as follows:—

1. For obtaining statistical information, uniform *proformae* should be prescribed and circulated by the Central Inland Fisheries Research Station.

2. For evolving suitable sampling methods for collection of catch statistics, surveys should be undertaken both by the Central and State Departments of Fisheries.

3. The Central Fisheries Training Course should include fisheries survey as one of the subjects in its curriculum.

4. Staff meant exclusively for conducting inland fishery surveys should be provided in all State Departments of Fisheries.

5. Every State should make an effort for the collection of fish spawn and fry in their own State.

6. Suitable model legislation for conservation of fisheries in natural waters and protection to brood fish may be prepared by the Central Government and circulated to all State Governments for adoption.

7. The Airways and the Railway Board should be moved to provide all facilities including concessional rates for quick transport of fish spawn and fry during the season between May and September in the different regions by the Ministry of Food & Agriculture. The programme for each year may be planned two months preceeding the season in consultation with the State Fishery Departments.

8. In States where there are swampy areas, efforts should be made to reclaim such swamp for the purpose of fishery development.

9. In developing reservoir fisheries of States, attention should be paid to settling refugee fishermen from East Bengal and as a first step the State Governments may examine the potential areas and the number of fishermen families who may thus be settled.

10. An Expert Committee should be constituted to evolve and suggest suitable method of measuring the progress of various inland fisheries schemes. This Committee should arrange for type studies being carried out to assess fisheries development in small selected areas and suggest a suitable standard method within a period of one year for adoption by the various States. The Committee may consist of the following with powers to co-opt others, if necessary:

    1. One representative from the State Government in which type studies are to be carried out.

    2. One representative of the Central Government. Meanwhile, returns on the data of fisheries development should be furnished by the various State Governments in the *proformae* in Appendix I and Appendix II.

C. *Fisheries Co-operatives*

1. Considering the importance and immediate necessity of improving the living conditions of fishermen and organising them into stable co-operative societies with a view to increasing the production of fish and the development of fishing industry, this Conference reiterates the sense and spirit of the Resolutions passed on this subject in the All-India Fisheries Conference held in Madras in September, 1956 but regrets to note that no appreciable results have been achieved upto now. This Conference feels that urgent attention of all concerned be drawn to early solution of the problems, preferably within the current financial year.

2. State participation in the share capital of the Fisheries Co-operative Societies be accepted in principle and sufficient financial assistance be given to the States by the Government of India through different financing agencies to facilitate such participation. All the facilities recommended by the All India Rural Credit Survey Committee in its report for the agriculturists should also be extended to such co-operatives.

Further, in view of the fact that implementation of the above recommendations is likely to entail some delay, schemes submitted on these subjects be favourably considered early by adjustment of provision under the Second Five Year Plan or from any other sources as an interim measure.

3. The Reserve Bank of India be requested to take immediate steps to treat fisheries production on par with agricultural production and for this purpose make available credit to fishermen's co-operatives.

4. In order to provide sufficient time and scope for proper development of fisheries, the period for leases of fisheries to co-operative societies should be reasonably long with the option of renewal,

subject to efficient working of the societies and proper maintenance of the fisheries.

5. In view of the backwardness of the fishermen in general, socially and economically, the State Government should pay special attention to the organisation of Fishermen's Co-operative Societies and their particular needs; provision of trained personnel and financial assistance to meet the cost of the management in suitable proportion be considered in deserving cases; and the State Governments should take all possible steps to educate the fishermen in co-operation and administration of their societies.

6. Development and organisation of fishermen's co-operatives require special attention and Fisheries Departments should be assisted with trained co-operative staff.

7. The agency of distribution should as far as possible be through co-operatives or federation of co-operatives. Until such organisation develops, the Fisheries Department should strengthen existing facilities and augment them wherever possible.

D. Extension

1 Having considered the need for employing improved techniques for fish culture, fishery management and other field practices and for popularising fish farming and conservation of inland fisheries, greater stress should be laid by the Centre as well as the State Governments on fishery extension activities especially in the Community Development Blocks. In this connection it may be noted that Fishery Extension Units have been set up by the Ministry of Food & Agriculture on a regional basis and by some of the State Fisheries Departments.

2. In order to intensify inland fishery development in rural areas, extension work should be undertaken in selected Blocks. Each State should undertake, on a pilot basis, with the help of suitably qualified staff, intensive fishery development in 2–5 selected Blocks, in the first instance, as a part of their fisheries development programme, so that the experience gained may be helpful in drawing up the extension programmes in the remaining Blocks.

3. Intensive fishery development programme in the Blocks should include training of Extension Officers, VLWs, Village Leaders, Survey of cultivable waters, establishment of nurseries, improvement of ponds, intensive stocking, exploitation of developed waters, marketing & rehabilitation of fishermen. In selecting the Blocks, the availability of suitable water areas, fish seed, facilities for marketing and existence of fishermen communities should be taken into consideration.

The Conference stressed the need for early implementation of the recommendations made at the Annual Conference on Community Development held recently at Mount Abu, and in particular, the following:–

1. Detailed survey of waters suitable for fish culture should be undertaken in each project area.

2. Improvement of suitable waters for purposes of fish culture by bunding and desilting should be undertaken. For the purpose, people's participation locally should be enlisted as far as possible.

3. A Fisheries Extension Officer should be appointed in each intensive development area, so that maximum use of culturable waters may be made. He should also be responsible for organising fisheries training for V.L.W.'s.

4. Sufficient seed should be supplied for stocking culturable waters.

5. The Staff of the Departments handling fisheries development work should be trained, particularly in handling of fish seed during transport and in rearing and stocking of fish.

E. Training

1. The Conference having considered the need for increasingly large numbers of technical, administrative and field staff for the various schemes under the fisheries development programme envisaged in the Plan, recommends that the States should fully avail themselves of the expanded training facilities and the Refresher Courses at the Central Inland Fisheries Research Station, Calcutta, in order to meet the requirements of their junior and senior technical personnel.

2. The State Governments should lay greater stress on fisheries training programmes for subordinate field staff, Village Level Workers, local leaders and fish farmers in the Community Development Blocks and should utilise the services of the Fisheries Extension Units and of the State Fisheries Departments for the purpose of providing suitable training.

3. The possibility of fishery being included as a subject in the syllabus for the Secondary Schools should be explored with the Secondary Education Board and the Ministry of Education.

F. Storage and Marketing

1. The Central Food Technological Research Institute should be requested to study the existing packaging, handling and distribution practices with special reference to fresh fish and take up a programme for developing suitable packaging and storage units.

2. The local Bodies be requested to take advice from the Central and State Departments in designing and improving the fish markets.

3. With a view to ensuring availability of fish at a proper price to the consumer and better returns to fishermen, the Central and State Warehousing Corporations should set up suitable marketing organisations at the main consuming centres like Calcutta, Bombay and Delhi where existing arrangements are inadequate.

4. New Fish markets should be established and existing ones improved.

(ii) Indo-Norwegian Fishing Community Development Project—Report for the months April 1958 to September, 1958.

Fisheries Section

The Boat Building Programme showed steady progress; one 30 ft. medium boat "M-6", was completed and launched by Prime Minister Shri Nehru

during his visit to the Project in April. Construction of seven 25 ft. INP boats, and 'INP-5' fish carrier was completed. Work on three 25 ft. INP boats is progressing while construction of three more INP boats was started.

Repair work on Surf 'I', 25 ft. INP boats, and 'Steel Dory' and 22 ft. boats issued to the fishermen was continued; overhauling and extensive repairs of hull, engine, electronic and electrical equipment of R/V 'Kalava' and general repairs of R/V 'Conch' and TCM vessel 'Sea Horse', repair of all Medium sized boats and installation of Winch on 'M-1' boats were carried out. The Electronic Expert continued the overhauling of electronic equipment of all vessels.

Maintenance of gear for the medium boats continued under the supervision of the Norwegian Gear Expert at the INP Cochin Branch. A new type of shrimp trawl was made under the guidance of the Norwegain Gear Expert and instructions were given to fishermen in repairing and overhauling of trawl nets etc.

Purse-seining experiments continued with 25 ft. INP boats at Neendakara. Otter trawling with medium sized boats, all with Indian Skippers and Crew, and "Ashtamudi" and "Flying Fish" operating mostly a few miles off Cochin continued with good results. Experimental hook and line fishing with R/V 'Kalava' and 'Sea Horse' on the rocky beds on the continental shelf north west off Cochin gave good catch of Kalava despite the heavy current.

Total catch of Project medium boats from April to September 1958 was 110·2 metric tons of which nearly 56 metric tons was prawns and 54 metric tons fish; the total value realised was Rs. 33,620/-.

At the Refrigeration Plant and Ice Factory about 259 metric tons of ice were produced and about 266 metric tons were issued during April to August, 1958 to the Deep Sea Fishing Station and Indo-Norwegian Project, Cochin and also to private customers.

Possibilities of marketing of fish in the High Ranges was examined by the Marketing Officer and a regular route has been established from Palai to Yelappara *via.* Eerattupettah, Kanjirapally, Mundakayam and Peermede for the supply of fish through regular agents and directly to fish mongers. There is a possibility of disposing of 1 to $1\frac{1}{2}$ tons of frozen fish per marketing trip on this route. The Marketing Officer took charge of the sales of fish landed in Cochin by the Project Boats. In accordance with the decision of the 7th meeting of the Standing Committee of the Project the draft by-laws of the proposed sales organisations have been drawn up and sent to the Registrar of Co-operative Societies for finalisation.

Fishery Training Centre

The Training of Indian Instructors and fishermen was continued in purse-seining operations, up-keep of boats, equipment and gear, fabrication of purse-seine net and new trawl nets, overhauling of trawl nets under the direction of the Norwegian Gear Expert. Trials in Surf riding, landing and hauling up were carried out with good results. The programme for surfing and beach landing has been drawn up and trials are expected to start early in October, 1958.

The 8th course of fisheries training was started early in September with 30 candidates and trainees got training especially in the functions of engines, driving the boats and construction and maintenance of gear.

PLATE I

Demonstration purse-seining, Indo-Norwegian Project, Cochin.

Chinese dip net, Cochin.

Marine Research

R/V 'Conch' and R/V 'Kalava' continued marine research cruises in the area between Cochin and Neendakara.

Health Section

The routine work in the clinics and of vaccination against small-pox and inspection of latrines were continued. The new Chief Medical Officer, Dr. T. Skillestad arrived in June, 1958. Equipment for a modern hospital laundry was received.

Production of pipes at the Pipe Factory continued. The total production of pipes upto the end of September amounted to 3,266 Premo pipes and 692 low pressure pipes.

Expenditure

The progressive total of Norwegian expenditure since the inception of the Project upto end of September amounts to Rs. 171·18 lakhs.

Expenditure from Indian funds for April, 1958 to September, 1958 amounted to Rs. 2,03,514.

(iii) Government of India's Deep Sea Fishing Station, Bombay

The exploratory fishing operations of the vessels of the Deep Sea Fishing Station, Bombay are as follows:—

Name of the vessel	1956-57 October 56 to June 57			1957-58 October 57 to June 58		
	Total catch	Value realised	No. of days fishing	Total catch	Value realised	No. of days fishing
	Ton. Cwt. lbs.	Rs. N.P.		Ton. Cwt. lbs.	Rs. N.P.	
1. Bumili	56 19 6	17509·30	120	8 9 3	2487·25	28
2. Champa	75 4 5	18764·77	156	8 3 38	2142·25	29
3. Bangada	66 5 49	18250·88	92	85 0 01	17294·87	80
4. Meera	31 7 71	10695·69	171	42 2 108	11927·21	135
5. Meenalochani	..	..	..	30 1 39	9303·49	96
6. Sagarkanti	..	..	..	9 14 5	2659·37	48

(iv) New India Fisheries Ltd.

During the quarter ending September, 1958 the four vessels of the New India Fisheries Ltd. continued bull trawling operations. The landings are as follows:—

Name of vessel	Period of voyage	No. of days absent from port	Quantity of fish caught			Catch/day's absence			Depth fished
			T.	C.	lbs.	T.	C.	lbs.	(Meters)
Satpatti & Pilottan	29-6-58 to 8-7-58	10	38	—	—	3	16	—	46—64
	13-7-58 to 22-7-58	10	50	—	—	5	—	—	56—62
	24-7-58 to 3-8-58	11	60	—	—	5	9	10	54—60
	5-8-58 to 13-8-58	9	73	—	—	8	2	25	49—56
	15-8-58 to 25-8-58	11	61	—	—	5	10	102	42—58
	27-8-58 to 4-9-58	9	70	—	—	7	15	62	43—62
	6-9-58 to 14-9-58	9	58	—	—	6	8	100	35—56
	16-9-58 to 25-9-58	10	78	—	—	7	16	—	32—60
Arnalla & Paj	2-7-58 to 13-7-58	12	53	—	—	4	8	37	48—70
	16-7-58 to 25-7-58	10	71	—	—	7	2	—	51—66
	27-7-58 to 7-8-58	12	74	—	—	6	3	37	51—59
	9-8-58 to 17-8-58	9	74	—	—	8	4	50	43—57
	19-8-58 to 27-8-58	9	66	—	—	7	6	75	42—59
	29-8-58 to 7-9-58	10	75	—	—	7	10	—	40—62
	9-9-58 to 20-9-58	12	66	—	—	5	10	—	42—68

(v) An overland transhipment of the Pearl Oysters

The authors give the details how a consignment of 500 Pearl Oysters (mostly *Pinctada vulgaris*) $2\frac{1}{4}$ to 1 years in age was transported from the Thollayiram par off Tuticorin to the pearl oyster farm of Krusadai Island. Water was changed a number of time on the way. It is noteworthy that the oysters withstood the various and sudden fluctuations of temperature of water in the tins and the farm.

(Chacko, P. I. and Pillai, C. M., Ind. Com. Journal, Vol. 11, pp. 145-146, 1956).

(vi) Improvement of fishing craft in Bombay State

Most of the existing fishing boats in Bombay State, originally designed for sailing, could be mechanised after slight modifications in lines. 'Satpati'

Country craft fishing vessel propelled by sail, Bessein Fishing Village.

Motorised Fishing Boat, Versova Fishing Village.

type of boat, the tank testing of which has been done at the Central Water & Power Research Station's ship testing tank at Khadakvasala, was found to compare fairly with good European boats. One 18' mechanised surf landing dory was introduced in the Saurashtra region.

Mechanisation of existing fishing craft continued and boats designed with better lines were built and demonstrated. There are, at present, 1,033 mechanised boats out of which 939 are fitted with inboard engines and 94 with outboard engines. During the last eight years, an average of 129 boats per year have been mechanised. For the purpose the Government subsidises 25% on boats and 33 $\frac{1}{3}$% to 50% on engines and also advances loans to fishermen directly or through co-operatives. Engines of different horse power and of English, Swedish, Norwegian, German and American makes have been used.

In 1957-58, the approximate prices of marine engines of different H. P. were as follows:—

	Inboard engines (diesel)	
	Rs.	
3 H. P.	3,400	
6 H. P.	3,100	(Semi-diesel)
10 H. P.	3,700	(Do.)
10 H. P.	9,400	
15 H. P.	10,900	
15 H. P.	5,400	(Semi-diesel)
20 H. P.	11,900	
25 H. P.	13,800	
30/35 H. P.	16,000	
40/45 H. P.	18,000	
50/55 H. P.	19,000	

	Out board motors (Petrol)
	Rs.
3 H. P.	800
4 H. P.	900
10 H. P.	1,600

The approximate cost towards annual repairs of engines is $\frac{1}{2}$% to 1% of the cost of engine for the first five years in case of inboard engines. With a little variation in regard to the type of engine, the cost of fuel and lubricating oil etc. per 100 hours of operation diesel engine per H.P. is about Rs. 6:25.

Non-mechanised craft operates, as a rule, for 16 to 18 days in a month and only 40% of the time away from port (within 20 miles). Mechanisation has increased the net handling capacity by 40%. The mechanised craft has extended the field of operation (*viz.* 50 miles for drift net fishing), can fish for 22 to 24 days in a month and 70% of the time away from port, and lands about 50% to 70% more fish.

The employment provided by an investment of Rs. 1,000/- in a mechanised fishing unit is 0·4 to 0·5 person while that by an equal investment in a non-mechanised craft is 0·8 to 0·9 person.

Indigenous gear has been redesigned for employing nylon and the State Government has formulated a scheme to advance loans for supply of nylon and other fishery requisites.

Since July 1956, nearly 60 to 80 fishermen are being trained every year in navigation, handling of engines, gear, etc., at two training centres.

(Directer of Fisheries, Bombay 7th October, 1958).

(vii) Salt water fish seed resources

Rich collecting grounds of Salt water fish seed, particularly of the mullets, have been located at various places in an eight miles length of the Vaigai river system from Atthangarai to Panaikkulam in November 1958 by the Central Fisheries Extension Unit, Mandapam. This region has not been explored hitherto. There is abundance of fry both in the upper and lower reaches of the river, where the respective salinities are very low and fairly high. Systematic survey of the entire region with a view to assessment of the abundance of different species in different months is being undertaken.

(Fisheries Extension Unit, Mandapam.)

(viii) Production of preserved and processed fishery commodities in Bombay State

Net product weight (Thousand metric tons)

Commodities	1954	1955	1956	1957
Fish, frozen	0·14	0·17	0·13	0·25
Stock fish (Bombay duck sun-dried unsalted)	6·48	7·01	8·11	7·70
Seerfish, Jewfish, Giant threadfin, Catfish, Mackerel etc. (salted)	1·84	1·93	2·23	3·79
Herrings, Sardines, Anchovies etc. (dried or salted)	0·37	0·74	0·54	1·59
Miscellaneous fish dried or salted	3·14	2·07	2·88	3·93
Crustaceans & molluscs (Prawns) dried or salted	0·91	0·93	1·10	1·00
Aquatic animal liver oils (Shark liver oil)	0·02	0·03	0·03	0·03
Shell grit and similar fishery products	0·02	0·04	0·02	0·04
Fish fertilizers	1·79	1·96	2·29	2·08

(Director of Fisheries, Bombay 7th October 1958).

Inland

(i) A note on paddy-cum-fish cultural experiments in Bihar during 1957

Experiments on paddy-cum-fish culture were started in selected cultivators' plots of the N.E.S. Blocks in the terraced farming areas of Chotanagpur Division of Bihar having lateritic soil. Care was taken to select plots having an assured depth of water in the plots ranging from 1–2 ft. and lasting for about 3 months during the rainy season. The fish fingerlings between the sizes from 1"–2" of major carps were released into them late in August and recovered late in November.

All the plots were also subjected to manurial doses consisting of mixtures of superphosphates and Ammonium Phosphates of the commercial varieties which were not found harmful to the fish.

No insecticidal treatments were applied. Being unconnected with streams and rivers no murrels or predacious fish were ever taken from the plot. However, some miscellaneous fish of small species were occasionally obtained along with the growing carp fingerlings.

Out of 24 experiments conducted, about a dozen were completed while the rest suffered due to drought conditions. The following conclusions were arrived at from the experimental data collected:—

1. Increase in the yield of paddy ranged from half a maund per acre to 4 maunds per acre in plots with fish as compared to the plots without fish, while the percentage increase ranged from 3·5 to 12·5.

2. Yield of fish went up from 15 seers per acre to 2 maunds per acre during the period of the experiments.

3. Catla fish attained a weight from 3 oz. to 8 oz. without any recourse to artificial feeding.

It is worthy of note that experiments were successfully completed mostly in paddy plots in the lowest strata of the terraces, generally known as the 'Don' lands, where the concentration of water through continuous seepage from upper terraces together with the concentration of nutrients organic and inorganic were at the maximum.

(C. P. Varma, Fisheries Development Officer, Bihar).

(ii) Fish seed production in Himachal Pradesh

As none of the fast growing carps of the plains is available in the hilly regions of Himachal Pradesh, the department of fisheries had to introduce exotic varieties of fish, which would thrive well in its waters. In 1955 (April) Mirror Carp fingerlings were brought from U. P. and stocked in the Pucca tank at Nahan, (Sirmur district) where it has established well. The fish has been breeding profusely in the tank at Nahan since March, 1956. During the last two years, the department raised 34,000 fingerlings of Mirror Carp and it is expected to raise about 20,000 fingerlings during the current year for stocking lakes and tanks.

The other exotic fish Brown trout (*Salmo fario*) is artificially raised at high altitudes and breeds naturally in the Paban, the Baspa (Mahasu District) and the Uhl (Mandi District). The department has raised 70,500 trout ova during the last two years at the small trout hatchery at Barot (Mandi District). One

more hatchery has also been established at Chirgaon (Mahasu District). About 1,00,000 trout ova are expected to be raised from these two hatcheries during the current year.

(Deputy Warden of Fisheries, Himachal Pradesh 12th December, 1958).

(iii) **Report of the Hilsa Investigations in India 1957-58.**

The investigations on Hilsa fisheries initiated in the National Hilsa Research Unit, established at the Central Inland Fisheries Research Station at Calcutta, were continued. Observations were carried out in the Hooghly, the Rupnarain, Padma, Ganga, Brahmaputra, Barak, Mahanadi, Godavari, Krishna, Cauvery and Narmada rivers and on the Saurashtra Coast. Two Hilsa Fishery Survey Centres have been established for the collection of catch statistics from the Rivers Padma, Godavari and Krishna. The Estuarine and Riverine Sections and the Chilka Lake Investigation Unit of the Central Inland Fisheries Research Station have organised the collection of *Hilsa* catch statistics from the different areas and the Central Marine Fisheries Research Station has arranged to collect the statistics of marine landings of *Hilsa*. Efforts are being made to cover the remaining areas through the cooperation of the State Governments.

There has been an unusual scarcity of *Hilsa* catches in many rivers since 1956. In the River Hooghly, where detailed investigtions are underway, it has been observed that the plankton population has also been at a very low level since 1956. In the river Cauvery, howerer, abundant catches of *Hilsa* were landed in the months of July-August in 1956 and 1957. This appears to be related to the unusual flooding of the river below the anicuts on account of the surplus from the Mettur reservoir.

The age and size composition and the stages of maturity of the commercial catches are being studied in all the rivers. To determine the success of spawning and the abundance of larvae and young fish in the rivers, periodic surveys are being carried out in the River Hooghly and these surveys will soon be extended to other rivers also.

Morphometric and meristic characters of large samples of *Hilsa* from all the river systems and from the Saurashtra Coast were studied for determining the populations. The analysis of the data collected so far indicate that most rivers have independent or semi-independent populations. Further detailed analysis of the data is in progress. Tagging experiments have recently been initiated for studying the migrations and intermingling of populations, if any, as also the mortality rates.

The meristic characters of a sample of poorly preserved specimen of *Hilsa* received from Burma are being studied.

(Central Inland Fisheries Research Station, Calcutta.)

(iv) **Inland Fisheries Development in Uttar Pradesh during 1957-58**

During the year, the fisheries development in the State showed satisfactory progress. Expenditure of Rs. 5,59,603 and Rs. 2,88,615 was incurred under regular and Plan schemes respectively and a revenue of Rs. 3,37,502 and Rs. 17,259 respectively realised.

306·64 lakhs of fry and 32·74 lakhs of fingerlings were collected. Out of the total of 86·36 lakhs fingerlings produced, 33·25 lakhs were stocked in 283 departmental tanks with an area of 7,363·61 acres; 22·76 lakhs in four irrigation

reservoirs with an area of 20,497 acres; 13·65 lakhs were supplied to private pisciculturists at the subsidised rate of Rs. 4/- per thousand and with a subsidy of 50% on their transport; 19·70 lakhs were stocked in improved tanks; 1,025 fingerlings of Mirror Carp were stocked in the Kumaon region.

7,732 mds. of fish was netted from departmental tanks and 4,960 mds. of fish was sold realising Rs. 1,32,265.

During the year, two new fry collection centres were located in Azamgarh and Gorakhpur; 23 tanks with an area of 697·10 acres were surveyed and 35 tanks and 67 nurseries were acquired and improved for rearing fish and fry. Renovation of one trout hatchery, at Kalyani and construction of a fish farm at Gujar Tal was started.

Construction of buildings and installation of cold storage plant at Allahabad were completed. Financial help to the extent of Rs. 10,000/- each was given to 8 newly organised fishermen cooperatives and private pisciculturists. 300 lbs. of nylon yarn was received from T.C.M. for fishing nets.

Research work on the hydrology of fish nurseries, tanks and fry collection centres and the effect of jute retted water on fishes etc. were carried out.

(Govt. of U.P., Lucknow 11-10-1958.)

(v) Annual report of the Central Fisheries Extension Units for the year 1958 Allahabad:

Calcutta:

Fisheries Extension Unit rendered technical help to State fishery officers in arranging supply of over 16 million fry and fingerlings and 9½ Kunkas of spawn of major carps to various State Fishery Departments and C.D. & N.E.S. Blocks. Special technique was employed for packing and despatch of fish seed by air and rail.

Over 40 fishery waters were inspected for poor growth of fish, fish diseases, fish mortality, weed infestation, presence of predators, pollution of water etc. Technical advice, instructions and demonstration given in this connection yielded satisfactory results. Owners of some sand quarry pits were induced to take up fish culture in derelict pits. Lectures and demonstrations were given to the State and Central Officers in connection with fisheries Refresher Course and to the trainees of the Government of India fisheries training course. Technical information was furnished in response to enquiries on fish cultural practices, supply of fertilisers, fish marketing, fish by-products, fishery implements, exotic and acquarium fish etc. Numerous Indian and foreign visitors from West Indies, Germany, Egypt, Nepal, China and Japan were also supplied information on fishery matters and acquainted with the working of the Unit. The Unit arranged talks to fishermen groups, exhibited fishery films on many occassions and participated in four exhibitions.

Gauhati:

Information was collected in respect of the fishing methods, fishing gear, fish catches, fishermen population, etc. From fishing village *viz.* Palashbari, Padumbari and Keotpara, where about 12,500 fishermen belonging to 265 families are actively engaged in fishing in the rivers with various types of nets and tackle. Prospecting and surveys for fish-seed sources in the rivers were conducted at Golakganj, Rangamati, Kharaghat, Bagribari, Bilasipara, Newghat and Silghat but no place was found suitable for carp seed collection except New Ghat and Bilasipara centres, where about 32,000 carp fry and

fingerlings were collected for the State Fisheries Department. Instructions on the improvement of tanks for fish culture were given to the Village Level Workers in NES and C.D. Blocks at Rangiya, Dimoria, Hajo, Rani and Jalah. Fishery films were also exhibited. Necessary technical instructions regarding the stunted growth of fish in tanks, manuring of ponds, Argulus infection and fin rot diseases in Carps etc. were given with beneficial results to fish farmers and the State Department. Destruction of large quantities of large sized fingerlings of major carps were observed at Sonamukhi, Bilasipara, Kharaghat, Bagribari, Banbari, Gouripore, Dhubri and other places and it was suggested to utilise the fingerlings for cultural purposes by arranging transport to the fish seed assembly centres.

Allahabad:

About 50 miles stretch of the river Betwa and some spots on the rivers Ganga and Jamuna were surveyed in connection with the location of spawn and fry collection centres.

A demonstration of deweeding operation was given at Kondar Tal in Gonda district and the economics and efficiency of different weeders were worked out.

Over 5 lakhs of fertilised eggs were collected from 3 pairs of *Labeo rohita* by induced breeding with pituitary hormone injections conducted jointly with the State Fisheries Department.

Tanks and large sheets of water were surveyed in Nainital district to suggest suitable fishing methods for proper exploitation.

Information regarding fish landings, percentage composition of species, nets and tackle and socio-economic condition of fishermen were collected from fishing grounds, fish assembly centres and fish markets. Necessary instructions on preparation of nurseries and stocking of lakes and *'tals'* were given to the Anglers' Association, Allahabad and several fish farmers. Talks on fish culture and fishery film shows were arranged for fishermen and villagers, village level workers in NES blocks areas. A large number of fishery tanks under many blocks were inspected and suitable instructions for improvement and stocking with fish were given. The Unit participated in Barsik Mela at Kanpur where fishery films were screened and talks were given. The programme of work of the Unit was drawn up in consultation with State Government Officers and Block Development Officers.

Bhopal:

Five possible spawn collection centres were surveyed on the Mahanadi river in Madhya Pradesh. A demonstration of spawn collection was given jointly with the State Fisheries Department at Dhana village on the Boori Narbada to members of fishermen Seed collection Association organised by the Unit. About six lakhs of carp fry were collected. Stocking of a big tank of 13½ acres was also demonstrated.

Series of lectures on fish culture were given to Village Level Workers at their training centre at Povarkheda, where a small fishery museum has also been set up. Fishery films were shown at the training centre. A class was also conducted for training State Fishery Officers at Bhopal on methods of pituitary hormone injections.

Interested persons were given necessary instructions on carp culture, murrel culture, etc.

Mandapam:

With the cooperation of Temple trustees, Panchayat presidents and Block Development Officers eight tanks have been stocked with *Tilapia* and other suitable fish. Panchayat Boards at Devipatnam and Tondi and Block Development Officer at Tiruvadanai were persuaded to improve and stock their respective tanks.

Publicity was given to the fishermen societies and fish farmers regarding (i) utilisation of sea weeds for preparation of food jellies, (2) preparation of quality fish meal for human consumption and (3) suitability of *Chanos* culture in fresh water areas.

Talks on inland fisheries were given to coastal fishing villages. Two lectures also were delivered to the Fisheries trainees of Government of India and also to the professors and students of the Presidency College, Madras, Madras Christian College, Tambaram and St. Teresa's College, Ernakulum and some school assistants of the Board High School.

The improved methods of fishing with modern tackle and preservation of fish in a hygienic manner were explained and demonstrated to the fishermen on the beach. The Unit participated in exhibition held at Ramanathapuram, Calicut, Rasipuram (Salem) and Delhi

Hyderabad:

Demonstrations of the technique for induced breeding of the major carps by pituitary injections were given to the State Fisheries staff at Nizamabad, Sankesula and Manair fish farms. A brood of *Cirrhina mrigala* was raised by the injection technique.

About 75 miles stretch of the Manjira river was surveyed for carp seed collection. Carp eggs were available for 2 days only near Nagareddipet area and small number of carp fry were available near the confluence of the river Manjira with the Godavari. At all other collection centres only minor carp spawn and fry were available. Arrangements have been made for the training of the Village Level Workers of the Pattan Cheru block on fish cultural practices. Fisheries films were shown at Pattan Cheru Block.

Bangalore:

The fish landing places, fish curing yards and fishermen cooperative societies were inspected and the possible improvements of the workings were discussed with the respective officers. The working of the fish farms at Coondapoor, Gangoli, Malpe, Kaup, Polippu, Mulky and Hosabettu were also examined.

Catla breeding investigation was taken up at Vanivilas Sagar. The river Vedavathi from Mathode upto a length of about 25 miles was explored for the spawning grounds of *Catla*. The spawn collection technique was demonstarted to the fishermen at Yardikera and fertilised eggs collected and reared in cloth *"hapas"* in the river.

Several tanks, and reservoirs including Bethamangala tank, Ramasagara tank, Guttahally temple pond and Markandeya tank were inspected and neces-

sary instructions were given to the owners for fish culture. The unit participated at the Dussehra Exhibition and fish film shows were organised.

(vi) **Supply of fish seed from Calcutta during the year 1958.**

Name of State	By Air	By Rail
1. Assam	21,35,540	..
2. Bombay	30,49,200+ one kunka spawn	2,41,230
3. Madras	1,10,000	..
4. Madhya Pradesh	..	80,12,400+ 7 kunka spawn
5. Mysore	18,17,750	..
6. Nepal	38,500	..
7. Orissa	..	1½ kunka spawn
8. Tripura	10,29,600	..
9. West Bengal	..	55,000
TOTAL	81,80,590+ 1 kunka spawn	83,03,630+ 8½ kunka spawn
GRAND TOTAL	1,64,89,220+9½ kunka spawn.	

It is anticipated that 1,10,000 more fry will be despatched before the end of the year.

(1 Kunka—2 to 3 lakhs of hatchlings)

(Central Fisheries Extension Unit, Calcutta.)

Technology:

(i) Preliminary investigations on the pit curing of fish in India.

A study of the process of pit curing of fish, which is practised mainly on the south-east coast of the Madras State, was undertaken with Mackerel to determine the optimum conditions for the cure, keeping quality of the products and to evaluate different chemical tests for detection of spoilage during storage. Although pit curing improve the organoleptic properties by imparting a characteristic flavour and softness to the flesh, the appearance of the product is rather unfavourable and its keeping quality is limited as against wet salted mackerel which keeps in good condition upto 2 months.

The beneficial effect of maturation or ripening under semi-anaerobic conditions in pit curing is reflected in the release of large amounts of free amino-acid nitrogen during the cure. However, the levels of Total Volatile Basic Nitrogen which had also increased during the curing period reached more than 500 mgm. per cent (moisture-salt-free basis) after two weeks of storage. The optimum period for the cure was found to be two days in the case of gutted mackerel salted in 1:5 ratio. A comparative study of the changes in T.V.B. Nitrogen, Trimethylamine, Formol Nitrogen and peroxide value

during storage revealed the usefulness of T.V.B. increase as a test for the assessment of quality.

(Suryanarayana Rao, S. V., Nayar, M. Rajendranathan and Valsan, A. P., Indian Journal of Fisheries, Vol. V, No. 1, April, 1958).

(ii) Determination of total volatile nitrogen in cured fish products.

The values of total volatile nitrogen obtained from three extracts of different samples of cured fish, when distilled under uniform conditions in the presence of alkalies—sodium borate, potassium carbonate and sodium hydroxide, have been compared. Experiments were carried out with a view to find out the extent of variation in the values of T.V.N. with the increase in the concentration of the fish muscle in each of the extracts on distilling with these alkalies. The results of these experimental investigations point out that for T.V.N. determination, it is preferable to prepare an aqueous extracts of the fish sample wherever possible and to use sodium borate as alkali. The advantage with alcohol extract, however, is that the proteins are precipitated and a clear solution remains.

(Krishna Pillai, V and Rajendranathan Nayar, M., Indian Journal of Fisheries, Vol. IV, No. 2, December, 1957).

(iii) Production of Agar agar, Algin and Mannitol

The authors have given a plan of the pilot plant to be set up at Krusadai Island or Pamban (i) to produce 200 lbs. of Agar agar, 100 lbs. of Algin and 20 lbs. of Mannitol per month and (ii) to serve as a demonstration centre to induce the fisher folk and villagers to take this up as a cottage industry for earning additional income. Agar agar is a jelly-like extraction from certain red algae (Rhodophyceae). Its extraction is a simple process of cleaning, drying, boiling, filtering and jelling. Agar is widely used in food and confectionary preparations and in certain pharmaceutical preparation agar is added as a stabilizer. The most important utility of agar is its employment as a microbiological culture media. Algin is an organic acid and occurs in brown algae (Phaeophyceae). Its preparation consists of washing, drying, powdering, treating with alchohol and alkate, filtering, acidifying and purifying. Algin has a wide application in industries, surgery and advanced research. Mannitol is a sugar-extract obtained as a bye-product from the brown algae during extraction of algin. It is used as a sweetening agent for diabetic patients and in the manufacture of explosives, emulsions, and vegetable oil substitutes.

(Chacko, P. I. and Pillai, C. M., Ind. Com. Journal, Vol. 11, pp. 80-81, 1956).

Trade:

(i) Supply and marketing of fresh fish in Delhi

Daily consumption of fresh fish in Delhi is estimated at four tons, most of which are fresh water fish from the Yamuna river, with some supplies coming from nearby localities in the Punjab and Uttar Pradesh. Salt water fish are not in much demand but small amounts mostly Pomfrets and Hilsa are received by rail from Veraval in Saurashtra. The Department of Fisheries Bombay State puts the volume of salt water fish shipped by rail from Saurashtra to Delhi at 300 tons during 1956-57, a hundred percent increase over 1955-56.

Commercial fishing rights (inland waters) vest in the State Governments and are issued on tender to the highest bidder for a specified locality or

area (tank, bank of a stream etc.) for a limited period, usually one to two years. The licencee is not necessarily a fisherman, for licenses may be granted to individuals, cooperatives etc.

Common fresh water fishing methods includes hand lines, cast nets. Ice is not available at the point of capture, so that delivery to market is a matter of some urgency. Transportaion may be by foot, bicycle, tonga, rickshaw and rarely by truck.

There are four privately operated auction places, where fish are sold to wholesalers. These auction houses charge six nP. per rupee, about 6% for their services. However, this is not the extent of their participation in the sales, for they are not only auctioneers but money-lenders, and their clientele in many cases are indebted to them for loans on the purchase of fishing gear and for other purposes. Since fishing is an unpredictable industry, interest rates are high so that the fisherman often receives only about fifty percent of the selling price after his account with the auctioneer has been settled.

Demand is relatively stable but production is not, consequently there are wide daily fluctuations in price, depending on supply. Consumer preference for certain species on religious or geographical grounds may also cause unusual fluctuations in prices due to relative abundance of various kinds of fish.

Although the handling of fresh fish from producer to consumer leaves much room for improvement from a sanitary stand-point the fish arrive at the auction rooms in unusually fresh condition.

(Smith, R. O.—TCM Fisheries Adviser, New Delhi, 20th November, 1958).

(ii) Trade in dried Shark Fins

The below mentioned parties deal in the processing and export of dried shark fins:—

1. *MADRAS*

1. Shri Gnanaprakasam Fdo Manapad Tiruchendur Taluk, Tirunelveli District.
2. Sri Viswasam Fernandez, Periathalai, Tiruchendur Taluk Tirunelveli District.
3. Sri Rayappan Villawarayer, Punnakayal, Tiruchendur Taluk, Tirunelveli District.
4. Sri Uvani Antony Fernande, Overi Nanguneri Taluk, Tinnevelli District.
5. Sri S. Muhammed Kanu, Thoppu Veedu, Thengapattanam, P.O.
6. Sri M. O. Mohammed Abdul Khader, Thengapattanam P.O.
7. Sri N. A. Peerukannu, Thengapattanam P. O.
8. Sri M. A. Peerukannu Near Kulathuppalli, Thengapattanam P.O.
9. Sri S. Mohammed Kannu, Thengapattanam P.O.
10. Sri M. M. Mohammed Kannu, Thengapattanam P.O.
11. Sri S. M. Abdul Iassacc, Thengapattanam, P.O.
12. Sri P. N. Syed Mohammed Kannu, Pathen Pandakasala Puram, Keezhkulam P.O.

13. Sri S. M. Company Forwarding Agents, Colachel.
14. Janab Mohammed Kannu, Enayam Keezhkulam P.O.
15. Sri Mohammed Kannu, Dried Fish Merchant Puthanthurai, Keezhkulam P.O.
16. Sri S. Banabander, Dried Fish Merchant, Eramanthurai, Thengapattanam P.O.
17. Sri A. Noor Mohammed, Thoppil Veedu, Thengapattanam P.O.
18. Sri A. N. Meeran Pillai and Bros., Thengapattanam P.O.
19. Sri N. Ganaprekasam Koothanguli P.O. *Via* Valliyeer Thiruneveli District.
20. Sri An. Govinda Nadar, Pamban.
21. Sri M. Alier, Kilakarai.
22. Sri Gomez, Pamban.
23. Sri M. M. Mohammed Meera Sahib, M. N. Ambal St. Kilakarai.
24. Sri Hammed Sultan, M. N. Abal Street, Kilakarai.

2. *KERALA*

1. United Industries. Cochin Ltd., Cochin-2.
2. Indo-Marine Agencies, Jew Town, Cochin-2.
3. M/s. Ebrahim, Mohammed & Brother, Jew Town, Cochin-2.
4. Morries & Sons, Jew Town, Cochin-2.

3. *MYSORE.*

1. Mokadam Moidin Haji, Fish Merchant, Bunder, Mangalore.
2. Shri Janardhan A. Kanchan, Bergre, Mangalore-3.
3. Shri M. Iddinabba, Fish Merchant, Golikatta Bazar, Mangalore.
4. Shri U. Hassanbava, Bengre, Mangalore-3.
5. The District Fish Marketing Co-operative Society Ltd., Bunder, Mangalore-1.
6. Shri D. P. Karkeda, Fish Merchant, Malpe (S.K.).
7. Shri Ullal Mohammed Moosa, Fish Merchant, Malpe (S.K.).
8. Shri Issak Bapu Chougale, Merchant, Bunder, Gangolli, (South Kanara District).
9. Shri S. Budan Sahib, Kanchikodi, P.O. Gangolli, S. K.
10. Shri Sardar Issuff Sahib, Fish Merchants, Gangolli S. K.
11. Shri Krishna Yesu Ambi, Majali, Post Majali, Karwar Taluk, North Kanara District.
12. Shri Noormanammad Alliabba, Post Karwar (Baithkhol), North Kanara District.
13. Shri Mohammed Haji Iddinabba, Post Bingi, Karwar Taluk, North Kanara District.
14. Shri Mohiddinabba, Baithkel, Post Karwar, North Kanara District.
15. Shri Ibrahim Sidi, Post Bingi, Karwar Taluk, North Kanara District.
16. Shri Abdulabba, Post Chendiya, Karwar Taluk, North Kanara District.

17. Shri Haji Abdulrahiman, Post Chendiya, Karwar Taluk, North Kanara District.
18. Shri Mota Pursu Durgekar, Post, Chendiya, Karwar Taluk, North Kanara District.

Socio-Economics:

(i) Fishermen Cooperative Societies in the Bombay State as on 30th June, 1957.

There are 101 Fishermen Cooperative Societies with a membership of 25,484, share capital of Rs. 10,17,454 and working capital of Rs. 30,14,840.

With a view to encourage cooperative endeavour among the fishermen, preferential claims are given to fishermen cooperatives while auctioning the Government lakes and tanks. The Government has also sanctioned a special scheme under the Second Five Year Plan for the development of cooperative fisheries.

Long term finance is being made available to these societies for mechanisation of fishing craft, purchase of big fishing nets, trucks etc. Financial assistance by short term loan is made available to the fisheries societies through the State Cooperative Banks at the rate of 2% below the bank rate. The Fisheries Societies will make available short term loans to fishermen at 6¼% interest repayable in 6 to 8 months. Fisheries societies generally get Rs. 10,000 as short term finance. For the loans, the societies take the personnel security of the members concerned and also the security of future catch of fish. It is binding on the fishermen receiving such finance to sell their catch through the cooperative fish marketing organisation of the area. A subsidy of Rs. 500 for the first two years and Rs. 250 for the third year, towards managerial staff is sanctioned to such societies. Five societies were granted a subsidy of Rs. 2,110 towards managerial costs during the year.

(Special Officer, Industries and Commerce Department, Government of Bombay).

MARINE FISHERIES RESEARCH

(i) Scientific report on the work of the Central Marine Fisheries Research Station, Mandapam for the quarter ending 30th September, 1958

Fishery Survey

The total landings of marine fish in India in the second quarter of 1958 were estimated at 123,657 metric tons as compared to 171,181 metric tons during the corresponding period in 1957. The decline in total landings was mainly due to the fall in the catches of *Harpodon nehereus* and Prawns in Central Bombay and *Leiognathus, Anchoviella* and *Thrissocles* in North Andhra. Against these decline there were noticeable improvements in Kerala and West Madras due to continuation of good landings of Oil Sardine, Mackerel and Catfishes in Kerala and *Anchoviella, Trichiurus* and *Lactarius* in West Madras.

The total man-hours spent during the second quarter of 1958 was 68,038,000 as compared to 65,526,000; the catch in kg. per man-hour in 1958 was 1·82 against 2·61 in 1957. The fall in the over all figure of catch per man-hour in 1958 was due to reduced catches in Bombay zones.

Fishery Biology

At Mandapam, investigations on the analysis of the morphometric data on Mackerel and comparisons of the regressions of certain selected characters on

the total length, and of the head height on head length indicated the probability of the existence of more than one stock of Mackerel in Indian waters.

Studies on the Choodai fishery in the Mandapam area with reference to length-frequency, maturity stages, food and feeding habits and scales and vertebrae were continued.

Biological studies on *Hemirhampus* and Mullets were in progress.

At Kozhikode, observations on the trend of fishery in relation to the gear operated, studies on the biology of Oil-Sardine and Mackerel, species composition, size-range of species, dominant size group and maturity of species constituting the prawn fishery and fishing intensity in inshore waters were carried out.

Observations on offshore fishing by mechanised vessels at Bombay showed that fishing was practically absent on account of the monsoon, with the exception of the New India bull-trawlers operating along the Saurashtra Coast. These bull-trawlers landed 3,48,992 kg. of fish during June to August. Sciaenids and eels formed over 65% of the total catch, sharks and rays constituting a little over 20% of the total.

Fishery biological studies on *Polydactylus indicus* (Dara), *Sciaenoides brunneus* (Koth), *Pseudosciaena diacanthus* (Ghol), *Polydactylus heptadactylus* (Shende) and *Harpodon nehereus* with special reference to maturity stages and sex-ratio in the catches, length-frequency, otoliths and growth, and food and feeding habits were continued. Otoliths from 152 specimens of Juvenile *'Koth'* ranging from 51 to 632 mm. in total length revealed some interesting observations.

The study of catch analysis of prawn fishery revealed that the most numerous prawn species *Metapenaeus affinis* were less abundant while *Parapenaeopsis stylifera, P. sculptilis, Solenocera indicus, Hippolysmata ensirostris* and *Leander tenuipes* were found to be totally absent in bull-trawler catches.

At Ernakulam, intensive study of marine prawn fishery and biology of *Metapenaeus dobsoni* and *penaeus indicus* from backwater catches has been continued regularly. In view of the growing economic importance of *Palaemon carcinus* an effort is being made to trace the life history of the species as a first step to gain full knowledge of its biology.

Investigations on the offshore fishing by mechanised vessels at Cochin showed that trawling operations were carried out off the Kerala coast from Cannanore to Cape Comorin and the largest catch of 1,81,071 kg. for the season and highest yield per unit of effort (trawling hour) 1,336 kg. was obtained a few miles off Cochin; areas lying between Alleppy and Quilon also yield high returns per unit of effort.

Observations on the general fishery conditions and biological studies with reference to maturity stages, size composition of catches, sex ratio and food and feeding of the Mackerel and Sardine fisheries of the area were continued at Karwar, Mangalore, Neendakara and Vizhingam. At Vizhingam, juvenile mackerel of 4-9 cm. were found in good numbers in the stomach contents of *Trichiurus savala* and mackerel fishery in August was mainly supported by 14-19 cm. size group and adult fish size 22-24 cm. in varying stages of spent condition.

The organisation of the work of new research unit at Laccadives is progressing and special attention is being paid to the tuna fishery of this area.

The work on the biology and fisheries of Mullets and Polynemids was in progress at Kandla.

At Madras, in connection with studies on Clams transference of adult and seed clams from the Adyar estuary to the Cooum estuary with a view to exploring the possibility of reclamation of depleted beds did not thrive well. Length and growth studies of clams were continued.

At Waltair, investigations on the biology and fisheries of *Scomberomorus guttatus* indicated that the fish was caught largely by hook and 40 to 45 cm.; mackerel with gonads in stage III of maturity was the dominant size-group during the quarter. A detailed study of the food and feeding habits of *Sardinella gibbosa* was made.

Analysis of the data from the trawl fishing by the West Bengal trawlers Kalyani I and V showed that more than 75% of the catch was composed of Sciaenids (Dhola).

Marine Biology.

At Mandapam, investigations on the organic production in the inshore waters of the Gulf of Mannar were intensified and observations were extended to subsurface layers.

Plankton studies at Kozhikode showed that the magnitude of the standing crop was of a lower order and *Fragilaria ocenica* was not so abundant as during the same period of last year, indicating that the Oil-Sardine fishery cannot be expected to be good during the current season.

Observations on the seasonal variations in hydrobiological conditions in the inshore and offshore waters off Kozhikode and plankton and hyprobiological studies at Mangalore and Karwar were continued. The study of the physical and chemical conditions of the waters off Bombay was in progress.

Oceanography.

In connection with studies on physical oceanography, computation was continued on the distribution of temperature, salinity, and density in the Arabian Sea for three different seasons, on the circulation in the sea at different levels, and on the sound velocity distribution with reference to the preparation of the correction tables to the echosounder. Dynamical computations were in progress on the circulation in the Arabian Sea related to the field of mass, the heat balance of the region, the transport of water in the region in different seasons, and the salt budget of the region.

Physiology and Fish Farming.

Experiments with *Tilapia* of different sizes at 25°C were completed and at 20°C was started. The apparatus for measuring the metabolism of fish fry of less than 0·5 g. weight was assembled and used successfully with *Tilapia* fry. The data on volume and density changes of Plotosus were statistically analysed and are being studied. Fish farming experiments indicated that a rather high rate of stocking (about 5,000 fingerlings per acre) was found necessary. Studies on the use of organic manures for enriching the ponds showed that application of sea weed and cowdung compost at 600 lbs. per acre and 105 lbs. per acre of bran and oil cake gave rise to a sustained bloom of microflora. Routine analysis of the water and plankton from the ponds and the surrounding lagoons were continued.

Algology.

The study of the economic marine algae of South India was continued with particular reference to morphology, ecology and to factors of value to sea weed instructives. Investigations on the succession of marine algae in Palk Bay and the Gulf of Mannar were continued.

Chemistry and Bacteriology of Fishes.

Investigations on the quality of ice-stored prawns were completed. Several objective tests for assessing the quality of prawns preserved in ice were examined and interesting differences were observed in the bacterial flora of prawns from Mandapam and from Cochin. Experimental studies on the use of shellac as a possible fish preservative gave encouraging results in the case of very small fish. Chromatographic studies on the identification and estimation of the free amino acids present in fresh fish and Crustacean muscle were continued.

Fish Curing & Fishery By-products.

Studies on the chemical changes occurring in the fat of *Lactarius* during different kinds of curing process were made. An analytical study was made of the data obtained in the experiments to study the different aspects of Mackerel curing. Fresh experiments were begun to study the optimum humidity conditions required for storing dry cured *Lactarius.*

Experimental work on the preparation of quality fish meal indicated that it was possible to find out that under the optimum conditions provided for the fermentation, the rate of multiplication of *Lactobacillus* organisms was very high during a period of four hours while other forms of bacteria did not grow under these conditions. Experiments are now being carried out to determine the effect of prolonging the period of fermentation on the chemical quality of the final product. Work on jelly-coating of frozen fish was continued. Examination of Sardine oil samples was periodically carried out to study its change in quality during storage.

(Central Marine Fisheries Research Station, Mandapam).

Fishery Biology.

(i) On the South Kanara coastal fishery for Mackerel, Rastrelliger canagurta (Cuvier) together with notes on the biology of the fish.

The paper deals with the coastal fishery of the region between Baikampady and Tarapathy in the South Kanara District. Special reference is made to the Malpe sector, where detailed observations were conducted during the 1954-55 and 1955-56 seasons.

The Rampani net, whose operational range is 1-1½ miles from shore, is the main gear employed. Details are given regarding the centres of fishing, manpower and the number of nets employed. As the Rampani nets of the South Kanara District are not operated at night, it is probable that they take only about 50% of a potential catch at present.

Mackerel gave an exceptionally poor yield during the 1954-55 season. This is indicated by the catch statistics relating to a 12-year period beginning from 1944-45.

Normally, there are two peaks of production, the first in October-November and the other during the February-March period. Sometimes deviations from this trend occur.

The normal modal size of one-year-old Mackerel appears to be 12-15 cm. At the end of the second year of their life, the fish probably measure 21-23 cm. The possibility is indicated that the population contains other age-groups as well. The length-frequency studies do not, however, reveal the total life-span of the species.

The fishery off West Hill and Malpe appears to be concentrated on one year old (*i.e.*, Mackerel in the second year of their life). Catch statistics show that the stock that supports the fishery touches the coastal waters only for a short period, in the course of its seasonal movements.

At the time of first spawning, Mackerel are about two years old. Spawning starts in April.

At the time when the Mackerel shoal in coastal waters, plankton is rich with edible forms. There is, however, reason to believe that the coastward movement of the fish may not entirely be a direct response to plankton production. (Sekharan, K. V., Indian Journal of Fisheries, Vol. V, No. 1. April, 1958).

(ii) The food and feeding habits of Polynemus indicus (Shaw).

The examination of 669 stomaches of *P. indicus* shows that its food chiefly consists of teleosts and crustaceans.

The surface feeding juveniles mainly feed on crustaceans and the column feeding adults on teleosts and crustaceans.

The feeding on teleosteans as food organisms is progressively increased as the fish grows in size, whereas there is no appreciable change in crustacean intake in various length groups.

The feeding intensity shows three different phases, high feeding—September to December, average feeding—January to April and low feeding May to August.

The intensity of feeding in female *P. indicus* is correlated with the changes undergone by the ovary.

(Karekar, P. S., and Bal, D. V., Indian Journal of Fisheries, Vol. V, No. 1, April, 1958).

(iii) On some larval and juvenile fishes from Bengal and Orissa Coast.

The account deals with 16 species of larval and juvenile fishes from the Bengal and Orissa coasts collected on board M.F.V. *Kerala* and I.N.S. *Investigator*. Stages of *Zenarchopterus buffoni* (Valenciennes), *Bregmaceros macclellandi* Thompson, *Callionymus melanotopterus* Bleeker, *Psettodes erumei* (Bloch and Schneider), *Pseudorhombus arsius* (Hamilton), *P. oligodon* (Bleeker), *Arnoglossus tapeinosoma* Bleeker, *Bothus* sp., *Samaris macrolepis* Norman, *Solea ovata* Richardson, *Heteromycteris oculus* (Alcock), *Cynoglossus* spp., *Triacanthus brevirostris* Temminck and Schlegel, and *Parapegasus natans* (Linnaeus) are described and figured. Of these the larval and juvenile stages of *Zenarchopterus buffoni* and *Parapegasus natans* form connected series and are dealt with in detail. The figure of an adult of the latter is reproduced. *Samaris macrolepis* which was formerly known only from a single specimen from the Southern Burma coast is recorded from the Indian coast for the first time. Early larval stages of *Bregmaceros maccellandi* are compared with the descriptions of larvae of the above species from the Australian waters and the significant differences are pointed out.

(Jones, S. and Pantulu, V.R., Indian Journal of Fisheries, Vol. V, No.. 1, April, 1958).

INLAND FISHERIES RESEARCH

(i) Scientific report of the Central Inland Fisheries Research Station, Calcutta for the quarter ending 30th September, 1958.

Pond Culture Division.

Fish breeding work by injection of pituitary hormones taken up in Assam was completed and nearly 10 lakhs of spawn was produced by this method and a little over one lakh of fingerlings of Rohu and Mrigal were obtained for stocking. This has enabled the Assam State Department of Fisheries to cancel its annual import of fish seed from Calcutta for the Joysagar fish farm and upper Assam area. By breeding of Carps at Cuttack Rohu and Mrigal breed successfully in cement cisterns but the results appeared to be better in the river water. About 15,000 fry of Calbasu and 2,35,000 fry of Rohu were produced by induced breeding. A total of 1,34,000 fingerlings were recovered, of which over 1 lakh were supplied to the Orissa Fisheries Department.

Selective breeding and hybridisation of selected species for combining desirable cultural qualities of the selected fish in the hybrid produced, has become possible with the successful breeding of Indian Carps by injection of hormones. Preliminary observations show very satisfactory growth in several of the hybrids.

The Common Carp, *Cyprinus carpio,* continued to breed freely, whenever breeding facilities were provided for them in cisterns or in *"hapas"*; natural production of fry in ponds was found to be very poor. Collections of laid eggs from stocking ponds and hatching them in *"hapas"* and rearing the fry in nursery ponds enabled production of an incomparably larger number of fingerlings than from the natural ponds; 13-14 month old breeders have attained 3 to 4 lbs. under favourable conditions. it breeds at an interval of about 2 months and the fecundity increases at each breeding. About 4 lakhs of fry were produced during the quarter. Relative growth of the Common Carp and the Major Indian Carp and growth of *C. carpio* with and without *Tilapia* are in progress. Attempts to hybridize the common Carp with Rohu was successful but there was heavy mortality of fry and only a few attained the early fingerling stage.

The experiments on the role of *Tilapia* as a forage fish for the Murrel. *O. striatus,* effect on the growth and survival of advanced fry of Rohu and Common Carp by populations of *Tilapia* in nursery ponds and Carp-Tilapia combination were in progress.

A fresh set of experiments on paddy-*cum*-fish culture in 8 plots with common carp fingerlings has been taken up.

Weed control experiments on the effect of Urea on *Ottelia* and fish in cement cisterns showed that all the plants and fish were killed with 50-125 ppm.

Investigation on treatment with "atlacide" and conditions favouring growth of aquatic weeds and algal bloom and studies on the antecology of *Pistia, Lemna* and *Ottelia* were continued.

Soil composition studies during the quarter included the correlation between soil composition and fish production, analysis of water and soil samples of fish farms, and observations on soil and water condition of the differently fertilised ponds.

Riverine and Lacustrine Division.

Fishery investigations in the Ganga river system at the Sadiapur assembly centre on the Jamuna, the Daraganj assembly centre on the Ganga at Allahabad and at Buxar in the Ganga were continued with special reference to estimation of total fish landings during the quarter, fishery and percentage species composition in the total landings, and the pattern of fishery.

Biological investigations on the biology of *Mystus aor, Mystus seenghala, Silonia silondia* and *Catla catla* were continued. For determination of age or size class composition, maturity and feeding of fish stocks, material was collected from the commercial catches assembled at Sadiapur. For estimating population dynamics of commercial species of fish of the Ganga system at Allahabad, the length-frequency and length-weight data collected at Sadiapur assembly centre on the Jamuna river from 1954 onwards are being analysed. The length-weight relationship of the four major carps landed in 1954 has been determined. With a view to study the breeding habits and breeding seasons of different species of fish in the Ganga river system at Allahabad regular bi-weekly collections of eggs, larvae and fry were made in the Ganga and the Jamuna. The ecological studies in the Ganga and Jamuna were continued.

Water pollution studies in the river Ganga at Kanpur to determine the lethal limits of some of the effluent components on *Cirrhina mrigala* of size range 30-50 mm. were carried out.

The Ganga survey and the Narbada-Tapti survey were continued and the monthly production of fish and the gear in operation at different centres, and the species composition of catches of these rivers were estimated.

In order to find out the major carp seed resources in the Narbada river, fry collection nets were operated at Hoshangabad, which revealed a low percentage of Major carps.

Lacustrine investigations at Tungabhadra Dam included operation of gill nets in the reservoir for estimation of production, study of fry and fingerlings collected from the reservoir and biology of important species of fishes with reference to their food, age, growth and fecundity. Limnological observations of the reservoir and plankton were continued.

Estuarine Division.

Studies on the fisheries and fish population of the Hooghly and the Matlah estuaries with special reference to catch-per-unit of effort in the three zones of the Hooghly, in the Rupnarain and in the Matlah, total catches of fish in the Hooghly-Matlah estuaries during June-August, and the percentage composition of the catches in the two estuaries were carried out. Analysis of the commercial catches indicated that fishery for adult Hilsa registered an improvement while juvenile *Hilsa* declined considerably; fishery of *Setipinna taty* showed a decline and the grey mullet fishery was not very pronounced; *Polynemus paradiseus* was the only species of thread fin in the commercial catches; the more common species of Cat fishes in the commercial catches were *Mystus gulio, Tachysurus jella, Pangasius pangasius* and *Osteogeneosus militaris;* the fishery of *Harpodon nehereus* remain unaltered and among the Jew fishes, *Pama pama, Sciaena glauca and S. ossea* contributed to the fishing.

The studies on the maturity, breeding and early development of the estuarine palaemonid prawns, were continued.

Hydrobiological observations of the Hooghly, the Rupnarain and the Matlah and studies on productive potential of brackish water bheris in relation

to the seasonal abundance of benthic algae and the cycle of soil nutrients in typical brackish water bheris of West Bengal were in progress.

Investigations on the *Hilsa* fisheries of India indicated that this fishery in the Hooghly, the Padma and the Godavari improved perceptibly during the quarter; in the Godavari, Rangoon net was the only net operated; *Hilsa* continued to afford a fairly good fishery in the northern sector of the Chilka lake and a fishery of much less magnitude than the normal existed in the Ganga; 3½ to 4 year age classes predominated in the commercial catches in the Hooghly, the Padma, the Ganga and the Godavari while in the Chilka Lake, the 1½ to 2 year age classes yielded the maximum catches. A programme of large scale tagging of *Hilsa* was successfully initiated.

Chilka Lake Investigations.

Investigations on the catch and biological statistics of the commercial catches relating to the species and percentage composition of the catches of the different sectors of the lake, their predominant sizes, and maturity and breeding habits of commercially important species, were continued. Biological observations indicated that due to the overwhelming abundance of larvae and fry of the Mud Shad, *Nematalosa nasusa* and *Gerres setifer* in the southern sector, the fishes breed in the lake.

Fish Pathology Investigations.

Studies on fish mortality of jute-retting tanks were started in collaboration with the Jute Agricultural Research Institute, in order to find out the causes of the reported mortality of fishes in jute-retting tanks.
(Central Inland Fisheries Research Station, Calcutta).

Fishery Biology

(i) Pysico-chemical qualities of Calcutta sewage from the view-point of pisciculture and the danger of feeding raw sewage to confined fisheries.

Physico-chemical properties of raw sewage of the city of Calcutta have been studied for a period of one year and the ranges of variations of different physico-chemical factors determined.

The inimical effect of raw sewage on fish life has been found to be due to the presence of CO_2, H_2S, NH_3 and suspended solids in high concentration, while it is potential as a fish-pond fertilizer for its high phosphate and available nitrogen contents as well as its high alkalinity.

Before introduction of sewage water into any fishery, dilution of the same by fresh-water should be so effected that a positive dissolved oxygen balance is maintained (oxygen consumption value below 20 p.p.m.) and the concentration of inimical ingredients brought down below lethal limits.

Introduction of raw sewage even by judicious regulation of doses raises the bed-level of the fishery and the toxic zone so created may cover the entire fishery in due course endangering fish life.

(Saha, K.C., Sen, D.P., Mukherjee, P.C. and Chakravarty, S.K., Indian Journal of Fisheries, Vol. V, No. 1, April, 1958).

(ii) Observation on the feeding habits of young Carp fry.

A series of laboratory experiments on the feeding capacity of carp fry under various environmental conditions were carried out during July-September 1952 and the results indicate the following:

1. The fry avidly feeds on zooplankton and gorges its stomach with them within an hour after commencing feeding. During the

same or even a longer period it hardly takes any phytoplanktons even if no other food is available in the environment. The fry thus distinguishes desirable from undesirable items of food and feeding is therefore selective.

2. Feeding capacity of the fry appears to be adversely affected by continued starvation. Artificial feeding of fry during temporary storage is, therefore, considered necessary to keep them healthy and avoid heavy mortality.

3. Feeding capacity is satiated only when the density of fry is low and the concentration of plankton high in the water.

(Alikunhi, K.H., Indian Journal of Fisheries, Vol. V, No. 1, April, 1958).

(iii) Biology and fisheries of the Grey Mullets of Bengal. Biology of Mugil cunnesius Valenciennes.

Distribution and raciation—The natural distribution of *M. cunnesius* has been traced. Morphometric studies indicate that members of this species occurring in the sea at Contai and in the Matla estuary at Port Canning belong to a homogeneous population.

Growth of body parts—The studies indicate that the standard length has the maximum rate of growth and the diameter of orbit, the minimum.

Length-weight relationship and relative condition—It is shown that there is no change in the length-weight relationship of the species with growth of the fish. The relative condition has been studied in relation to the size of the fish and the months of capture. Their possible indications are discussed.

Maturation, spawning and fecundity—There appears to be only one spawning season in a year, which lasts from May-June to July-August. There is no conclusive evidence to show that the individual fish spawns more than once during a spawning season. The smallest maturing fish obtained is 130 mm. long. The fecundity of the species ranges from 14,913 to 56,486.

Age and growth.—Scales of *M. cunnesius* have been found to afford reliable evidence of its age. It has been possible to estimate the size of fish at the end of the first five years of life and the annual increments in length. The maximum (*i.e.*, limiting) length of the species was found to be 300 mm. standard length. The size of fish at the end of the first year of its life, as estimated from the length-frequency distributions, has been found to support the result obtained from scale studies.

Migration and fishery—It is doubtful whether there is any long-range migration of *M. cunnesius*. There is, however, a clearly discernible seaward movement of maturing fish. The fishery of this species consists mostly of the O year group and the one year group of fish.

(Sarojini, K. K., Indian Journal of Fisheries, Vol. V. No. 1, April, 1958).

FOREIGN

GENERAL AND DEVELOPMENT

Marine

(i) World fish catch still increasing

The world total commercial fish catch is still increasing and is now about 30 million metric tons a year. The latest world catch figure of 29,960,000 tons in 1957 shows an increase of almost 50 per cent over the catch in 1938, the last

full fishing year before the Second World War, when 20,500,000 tons were landed.

Since 1947, when the catch (17,940,000 tons) still showed the effects of war, there has been a steady increase in the total each year. The annual increase during the past five years had been about five percent.

Most significant of the increases by continents since 1938 were those of Africa (from 520,000 to 1,860,000 tons), Asia (from 9,360,000 to 12,880,000 tons), Europe (from 5,590,000 to 7,640,000 tons) and those of the Union of Soviet Socialist Republics (from 1,550,000 to 2,540,000 tons).

Japan not only continued to be the World's foremost fishing country, but was actually widening the gap between itself and the second country, the United States (including Alaska).

The following seven countries landed more than one million tons of fish in 1957: Japan, 5,399,000 tons, The United State (including Alaska) 2,741,000; China (mainland) 2,640,000 (1956); U.S.S.R., 2,535,000; Norway, 1,738,900; India 1,233,000 and the United Kingdom, 1,014,700. Canada (including Newfoundland) which caught 1,091,900 tons in 1956, caught only 9,91,700 in 1957. India which just topped the one-million mark for the first time in 1956, moves two places up in 1957.

The 1953-57 average annual world catch of 27,900,000 tons, six countries (Japan, the United States, China, U.S.S.R., Norway and the United Kingdom) caught 55 percent. The next seven countries caught 19 percent, and the remaining 27 caught 21 percent. Thus the 40 leading fishing countries catch 95 percent of the world total landings, while the other countries only catch about five percent of the total among them.

There was little change in the relative percentages of groups. Herrings, Sardines, Anchovies, etc. with 24 percent of the total catch, make up the biggest group. There was great increase in canning fish products in U.S.S.R.; in 1946 the Soviet Union canned 46,000 tons but in 1957, the figure was 2,29,000 tons.

(Food & Agriculture Organisation of the United Nations, Rome)

(ii) Production and disposal of fish in Cambodia.

The Great Lake or Toule Sap, a good breeding ground for fresh water fish accounts for about half of Cambodia's average annual production of 130,000 tons, out of which 35,000 tons are used annually for the production of dried fish. The annual production of sea water fish is estimated at between 20,000 and 30,000 tons; mainly for export and domestic consumption as fresh; a small part is for processing into dried fish. 80,000 tons of fresh, salted, dried and smoked fish are absorbed annually by the home market.

In 1954, 17,400 tons of fresh and dried fish valued at Ri 100 million were exported; in the first half of 1955, the total quantity exported amounted to 6,800 tons valued at Ri 31 million. In view of the postwar fall in exports of fish to traditional market,—Viet Nam, Singapore, Hong Kong and Indonesia—efforts have lately been made to develop other markets in Laos and Viet Nam where competition from similar products from Thailand and Japan is, however, strong.

'Current Affairs Bulletin, No. 17, November, 1956, p. 7).

(iii) Iceland

There were 82 freezing plants in Iceland in 1956, available for fish freezing and storage. Two of the plants are reported to have been inactive for some time. In addition to the land-based plants, four of the larger trawlers are equipped with freezers, each with a freezing capacity of two metric tons of fillets in 16 hours.

The 82 plants are located in six districts and vary from 7 to 24 plants in each district. Under the most favourable circumstances the land-based plants can freeze 1,102 metric tons each 16 hours and store 38,270 tons. The annual capacities for both freezing and storage will vary according to the length of the season, the availability of labour, and transportation facilities. The capacity of the plants for the storage of fish for human consumption is limited by the need for space for about 8,000 tons of fish bait and the seasonal storage of 6,000 tons.

(Commercial Fisheries Review, Vol. 18, No. 8, p. 66, August, 1956)

(iv) Fisheries of Norway

Although they made a good start in 1957, the Cod fisheries of Lofoten have had to contend with the worst oceanographic conditions of 68 years. This winter the colder and less salt coastal waters have pressed down on the fishing banks, keeping the Atlantic water—and the fish—away. Results have been catastrophic and the Norwegian Department of Fisheries was authorised to grant initially Kr. 150,000 (£ 7,500) for the purchase of fuel oil in order to enable some of the fishing boats either to continue fishing or to sail home. At the small and isolated fishing village of Nordoyan, however, large shoals of spring cod suddenly appeared for the first time for 25 years.

Norway has now answered Russian proposals for a bilateral agreement on mutual cooperation in fisheries research, saying that exchange of knowledge in this field would be useful, but that it should take place within the existing international institutions. Cooperation on the part of the Soviet would be of the greatest importance for Norwegian cod fisheries in the Lofotens and off the coast of Finnmark, and also for other nations' fisheries in the Barent Sea.

(World Fishing, Vol. 6, No. 5, May, 1957, p. 54)

(v) Fisheries of Iceland

The total Icelandic fish catch during the year 1956 amounted to 4,43,694 tons, of which 2,69,952 tons were caught by cutters and other small craft and the remaining 1,73,742 tons by trawlers. The corresponding figures in 1955 are—total: 4,08,952 tons, cutters 2,34,514 tons, trawlers 1,74,438 tons. Of the total, cod was far and away the most prominent, accounting for 2,34,186 tons, while 1,00,465 tons of herring were landed.

(World Fishing, Vol. 6, No. 5, May, 1957, p. 54)

(vi) Two new fish meal plants in operation

Two new fish meal and fish oil plants began operations in 1956 at Ronland, on the northwestern coast of Jutland in Denmark. One plant is run by a corporation and the other by a cooperative. Present capacity of both plants is about 150 tons of raw fish daily, but the corporation plant has already announced plans to extend its daily capacity to nearly 300 tons of raw fish.

It is also reported that landings of "tobies" (a type of small sand eel) on the west coast of Jutland have been unusually heavy in the current season and that fish meal plants in the area have been forced to set an informal limit upon the total amount of "tobies", which will be accepted from each vessel.

(Commercial Fisheries Review, Vol. 18, No. 8, p. 65, August, 1956).

(vii) Japanese–Mexican fishing company planned

A joint Japanese-Mexican fishing company known as Japan-Mexico enterprises, Ltd. was formed in Mexico. Plans reportedly call for 70 Japanese dragnet fishermen to go to Mexico initially, with a possible increase in numbers upto 3,600 in the future. The organiser of this company is the Hakodate (Hokkaido) Dragnet Fishery Cooperative Association, in collaboration with Mexican fishing interests. Mexican Government has granted permission for the entry into Mexico of 6 Japanese trawlers and 36 skilled Japanese fishermen for a period of 6 months. Application has been made to the Fisheries Division of the Hokkaido Prefectural Government for certificates of qualification for the 36 fishermen.

(Commercial Fisheries Review, Vol. 18, No. 8, p. 66, August, 1956).

(viii) Fishing fleet expanding for distant–water fishing in U.S.S.R.

The Russian fleet of large ocean trawlers or factory ships will be increased to 50 during the sixth five-year plan running from 1956 to 1960. The trawlers are equipped with freezing and filleting machinery and use a stern slipway for hauling the trawls. The first group of 14 trawlers have a cargo capacity of 600 metric tons each, carry 100 men, have 1,900 horse-power engines, and fish for both cod and herring.

Since the trawlers are too large to go through the white sea canal, they must go back and forth along the Norwegian coast between Yallin and Leningrad in the Baltic sea and Murmansk and Archangel in the North.

The Russian herring fleet off the Norwegian coast was reported to number 300 units. Fifty vessels have conducted extensive herring research and now know exactly the herring migration from and to the Baltic Sea and Murmansk.

There are five Arctic weather observatories supplemented by smaller coastal stations and four floating icefield stations. The Stations make the usual meteorogical observations, conduct ocean research and other research in connection with navigation. The Northern Sea route is now kept open 3-4 months each year, but the goal of the sixth five year plan is to increase this to 5 to 6 months. This will be accompanied with the regular ice breakers. An icebreaker with atomic engines will be tested during the five year plan but cannot be set into operation until after 1960. The longer navigating season will be of considerable importance to the Soviet fisheries since it will then be possible to shift the new trawler fleet back and forth between the North Atlantic and the North Pacific to areas where the fishing potential is the greatest.

(Commercial Fisheries Review, Vol. 18, No. 8, p. 75, August, 1956.).

(ix) Japanese fishing fleet

In 1956, a total of 385,722 powered and non-powered vessels were engaged in the marine fisheries of Japan. A total of 142,265 powered vessels were engaged, of which 115,640 were under 5 gross tons, and 296 were over 299 gross tons.

(Western Fisheries, Vol. 53, No. 5, February, 1957, p. 20.).

(x) Denmark fish consumption down

In the past 5 to 6 years the per capita consumption of fish in Denmark has declined steadily from 35·2 to 24·2 pounds annually. The main reason is said to be the high price of fresh fish and, the steady increase in the number of boats fishing for industrial fish and the resulting decline in the catch of fish for local consumption.

The trend toward more industrial fishing continues and there seems little possibility of formulating a plan to check it. Another factor in the high price of fish is the increased cost of distribution, which is also connected with the Danish consumer's preference for buying fish in a live rather than frozen state.

(Western Fisheries, Vol. 53, No. 5, February, 1957.).

(xi) Japanese train Malayan fishermen

About 40 Japanese fishermen, employed by a Singapore firm, will train Malayan youths in Japanese method of fishing, whom they are expected to replace eventually. In the first year the trainees will be taught the theoretical part of the fishing industry and spend the second year doing practical work at sea.

The venture, in addition to the development of the deep-sea fisheries, plans for a shore plant to can and salt fish for local consumption, as well as for export.

Other developments include the motorisation of fishing craft with outboard motors which has increased the catch of the motor-equipped boats by 60%. The Singapore Government has assisted the fishermen in mechanisation of their craft with the help of a loan fund, which has raised the number of outboard motors in use from 100 to 550. The Fishery Department maintains a mobile unit, consisting of 2 mechanics, to assist in servicing and teaching the fishermen in the use of outboard motors.

Two exploratory vessels are maintained by the Singapore Government and British Government, to locate and survey new fishing grounds in South East Asia. Information on new fishing grounds, if and when discovered, are passed on to the fishermen.

(Western Fisheries, Vol. 53, No. 5, February, 1957.)

(xii) "Paragon and Celtic" run gillnet tests

The Schooners *Paragon* and *Celtic* were charted in 1956 for off-shore gillnet fishing by the U.S. Fish and Wildlife Service. The vessels were used for off-shore gillnet fishing in the north-east Pacific Ocean to carry out part of the programme of the North Pacific Fisheries Commission. The schooners had gillnets of varied mesh and approximately 20′ deep for capturing salmon in the off shore waters. The *Paragon* participated in similar work during 1955 and encountered heavy seas and winds close to 90 miles per hour during the latter part of the survey. Charting of two vessels makes a total of four Puget Sound schooners engaged in work for the U.S. Fish & Wildlife Service. All vessels were accompanied by technical fisheries workers from the U.S. Fish & Wildlife Service.

(Pacific Fisherman, Vol. 54, No. 9, p. 29, August, 1956).

(xiii) Noumea Training Centre

F.A.O. and the South Pacific Commission jointly sponsored the Noumea Training Centre, on 19 November at Noumea, New Caledonia. The 14-week course ending on 23 February 1957, was attended by fishery officers from the countries in the region of the South Pacific Commission and the Indo-Pacific Fisheries Council. The course includes lectures and seminars covering fisheries

technology, biology and economics. The range covers life and habits of commercial species, methods and gear used in catching fish, boats and equipment, the prinicples of fish processing, management practices, fishermen's cooperatives, and the distribution and selling of fresh and processed fish and fish products. (F.A.O. Bulletin, No. 53, November, 1956, p. 5.).

Inland

(i) World's longest salmon ladder

World's longest salmon ladder is in the Rana River, North Norway. Main feature of the ladder is a tunnel about 500 yards long blasted out of rock. Upto now the salmon have only ascended about 5 miles up the river. The tunnel will enable them to travel many miles further upstream, and greatly increase the stock of fish in the river.

(Western Fisheries, Vol. 53, No. 5, February, 1957.)

(ii) Chanos culture increases

Acreage devoted to Chanos culture increased from 100,097 hectares in 1954 to 104,953 in 1955 representing an increase of 4,856 hectares or 4·0% over the year. This is in keeping with the trend during previous years. Culture techniques are being improved by the use of fertilizers, artificial feeds and adoption of fish pond management methods successfully employed in other countries.

(Current Affairs Bulletin, No. 17, November, 1956.).

(iii) Non-indigenous fish established

Common carp, *Cyprinus carpio*, introduced in Philippine waters is well established and also accepted as a desirable food fish. Another successful introduction is Pla Salit, *Trichogaster* spp. Giant Gourami, Blue Gill and Black Bass introduced in the Philippines did not prove of significance. The competition that *Tilapia mossambica* offers to *Chanos*, a well-liked fish, has made its introduction a controversial issue.

(Current Affairs Bulletin, No. 17, November, 1956.).

(iv) Philippine nursing technique for chanos succeeds

In East and West Java the Philippine method of nursing of chanos fry proved successful. Fry mortality was reduced to almost half of that with common Indonesian methods.

(Current Affairs Bulletin, No. 17, November, 1956.).

(v) Fisheries of Nigeria

The Eastern Nigeria Government voted £ 91,000 for the development of the fishing industry in the Greek areas of the Region under its 5-year Development Plan ending in 1960. More than half the cost of this project is being met by a grant of £15,175 from the Colonial Development and Welfare Funds.

To expand the work already done, the Government had planned to intensify the construction of new fish ponds and the development of canoe fishing and power sea fishing. These canoes were to be locally made and sold at cost to local fishermen. Adequate provision exists for loans, if required.

(World Fishing, April, 1957, p. 70.).

Technology

(i) How to clean fishy surfaces

In the food industry, cleaning dirty surfaces includes both removal of dirt and killing bacteria. The chemicals developed for these purposes, called sanitizers, fall into two groups : Detergents which remove the dirt, and disinfectants

which kill the bacteria. Many detergents and disinfectants can do both. Bacteria are responsible for spoilage of fresh fish, reddening salted fish and occurrence of bilgy fish; causing food poisoning; endangering the health of workers; marring sales appeal. For cleaning, only sea or tap water should be used. Detergents should have the following properties: quick and complete solubility; non-corrosive; good water softening action; good wetting and penetrating action; ability to emulsify fats; good dissolving, dispersing and suspending action; good rinsing and if possible, good disinfectant properties. A temperature of 115° F. to 120° F. (46:1 to 48:9. C) is optimum and water jets used for cleaning should have a pressure of at least 15 to 25 lbs./sq. in. There are 4 types of detergents: (1) alkalis and alkaline salts, such as NaOH, metasilicate, and Na_2 Co_3. These do not function well in hard water but have food dissolving and emulsifying powers; (2) polyphosphates; they have water softening properties; (3) mentral synthetic detergents : these have good wetting, penetrating, emulsifying, dissolving and dispersing action; (4) acid detergents, which are relatively unimportant. Two methods of disinfection can be used. Physical methods include heat, ultra violet rays and electronic sterilisation Chemical disinfectants fall into four groups : (i) phenol and related chemicals (ii) pine oil disinfectants (iii) chlorine and hypochlorites; (iv) quarternary ammonium surface active disinfectants. Phenolic compounds and pine oil derivates are not widely used because of their strong odor which may taint the fish. Chlorine is the cheapest and best disinfectant for the food industry. It is generally used in the form of hypochlorite solution. For a clean surface, 50 to 100 p.p.m. and for a dirty surface 200 to 1,000 p.p.m. of chlorine should be used. Excessive chlorine is corrosive. Quarternary ammonium compounds are mild detergents, effective bactericids and non-toxic, but more extensive than hypochlorite. For scientific cleaning smooth impervious surfaces, such as those of metal and plastic, must be used. The surface should be thoroughly cleaned with warm water, detergent and rinsed in hot water, then disinfected and rinsed again.

(FAO World Fisheries Abstracts, Vol. 8, No. 5 September-October, 1957.).

(ii) Sulphite ice stops prawn black spot

The development of black spot discolourations or spots on prawns has been a problem in the industry for many years in practically all countries where prawns are utilized for food. Research on Australian prawn trawlers has shown that the formation of the melanin pigment ordinarily depends upon the availability of three substances; (1) A suitable substance, usually tyrosine or hydroxyphenylalanine, (2) Molecular oxygen, (3) The enzyme tyrosinase, a copper-protein complex. If any one of above three chemicals is absent, the formation of black spot is impaired. Prawns packed in ice containing 0·25 percent sodium bisulphite or sulphite were protected almost perfectly from black spot formation for 14 days. One quarter percent sodium chloride ice also protected the prawns fairly well from black spot formation, but not as well as the sulphite ice.

The use of sulphite ice for storing prawns has advantage and some drawbacks; it generally depresses melanogenesis (Black spot) in prawns; it also keeps them slightly colder and decreases the number of bacteria, thus lengthening their storage life. The prawn retain their natural colour and the sulphite prevents odours for a longer period. However, certain sections of the prawns which come in contact with the ice are bleached. These areas become brown when the prawns are cooked and are slightly tougher than the remainder of the prawn. It is thought, however, that weaker solutions of sulphite will give good results and that when thoroughly washed at a commercial plant will prove to be free of sulphite.

On prawn trawlers, the prawns should be thoroughly washed and iced down within 2-3 hours of being brought abroad. Headed prawns can be kept for a longer period than whole prawns.

(Fisheries Newsletter, Vol. 15, No. 9, September, 1956).

FISH PRESERVATION

(i) Problems in the use of Antibiotics for preserving Meat and Fish

The possibilities of using antibiotics for preserving meat and fish and the problems involved, both general and in relation to public health are reviewed.

Preservation of fish with antibiotics.

With fish, it is practicable to apply the antibiotics only at the post mortem stages, in 2 main ways: (i) in the form of dips, aboard ship, before or after gutting and washing but before storage below, or ashore, with whole gutted fish or fillets; (ii) incorporation of the antibiotic into chilled sea water in which fish are kept; (iii) incorporation of the antibiotic into the ice used for chilling fish either aboard ship or ashore. Coho salmon dipped 1 min. in sea water containing 5 to 10 p.p.m. aureomycin, kept little better, judged bacteriologically, than the controls during storage in ice for 13 to 18 days. Ling cod dipped for the same time in 3% brine containing 50 to 100 p.p.m. aureomycin, gave significantly lower counts than the controls during storage periods upto 10 days in ice. The storage life of Salmon, Grey cod and Lemon flounder in refrigerated sea water (at —1°deg. to —0.5°deg.C or 30.2°deg. to 29.8°deg.F) with 2 p.p.m. of aureomycin was greater, judged bacteriologically, than those stored in ordinary refrigerated sea water. In a series of experiments using Ling cod or Salmon, stored in flake or crushed ice containing 1 to 2 p.p.m. aureomycin, have claimed very considerable suppression of bacterial spoilage, with a consequent over all extension of storage life of about 5 days. The antibiotic ice was applied immediately and continously after catching and during the storage period. Even distribution of the antibiotics in large, commercially produced blocks of ice was obtained by adding a colloid, such as carragean or carboxymethylcellulose, with the antibiotic to the water before freezing.

Implications towards public health.

In as much as the quality of antibiotics, ingested in a treated food is far less than a therapeutic dose it appears that with a suitable choice of antibiotics, the immediate toxicity might not be a serious difficulty, though the effects of continued investion require investigation. One of the dangers is that a person may become habituated to the antibiotic. There are indications that presevation of foods with antibiotics might reduce the incidence of food poisoning. Other considerations are the possibility of destroying the antibiotics in the food, as in cooking, the development of resistant spoilage organisms, the mode of action of the antibiotic, and the necessity of using antibiotic mixtures to inhibit all types of spoilage organisms. The application of legal regulations depend on the existence of convenient, reliable and accepted methods for quantitative analysis of the antibiotics.

(FAO World Fisheries Abstracts, Vol. 8, No. 2, March/April, 1957, p. 27).

(ii) The use of ozone in the processing and transport of sea fish.

Ozone, being atmospheric oxygen "activated" in an electric field, is used as a deodorizing or a bactericidal agent because of its oxidative properties. In deodorizing, ozone oxidises the off odors in the air, which are mostly of organic origin, or makes them less perceptible by a blending with its own specific

odour. For deodorizing, only small quantities of ozone are needed. For bactericidal action, larger concentrations are necessary but these need not be applied continuously; in a cold store room, ozone should be used in doses of short duration at 4 to 5 hours intervals. Ozone should, however, not be applied directly to fish.

In the processing of fish, the multiplication of micro-organisms can be reduced by exposing the fish to air which have been treated with ozone and by washing in ozone-sterilised water. It is suggested that immediately after the catch, all fish should be washed in water sterilized by ozone and that the same should be used for the cleaning of all apparatus with which the freshly caught fish come into contact. Fish exposed in retail shops should keep fresh longer if continuously fanned with slightly ozonised air. This would, at the same time, remove off-odours. No special technical difficulties are expected to introduce ozonising apparatus aboard fishing vessels as such equipment has been used for many years on freight and passenger ships. An ozone producing installation, especially adapted for use on board is described. In a square metal box with a lid, there are four discs in which a high tension electric field is generated. Under the box, a ventilator is placed for carrying the ozone-air mixture through the desired air ducts. The electric discharges producing the ozone can be observed through four small windows in the lid of the box. The ozoniser should be fed with preferably cold air at a low moisture content.

(FAO World Fisheries Abstracts, Vol. 8, No. 2, March/April, 1957, p. 19).

FISH PRODUCTS

(i) Shark Fins.

Shark fins, with a few exceptions such as the pectoral fins of the saw shark and the upper lobe of the tail in all the shark spp. are of commercial value mainly for preparing soups. These appendages should be cut out before skinning the fish, scraped to eliminate any flesh, skin, etc. and washed with sea water for some time or overnight to facilitate their cleaning. The fins are sundried over chicken wire mesh trays extended 2 to 3 ft. above the ground, taking care that they are not left out in the rain. During the first few days the fins should be turned over periodically and kept under cover at night to protect them from the dew. With good weather and plenty of sun the fins can be properly dried in about 14 days.

(FAO World Fisheries Abstracts, Vol. 8, No. 2, March/April, 1957, p. 33).

(ii) How Flour is made from Pilchards

The flour made from fish is used in South Africa for fortifying bread.

The raw material consists of commercial fish meal for press-cake prepared from maashanker, *Trachurus trachurus*, or pilchard, *Sardinops ocellata*.

The process involves the following steps:

(a) The Crude meal is extracted with a solvent mixture consisting of 90% of industrial ethyl alcohol of 96% strength and 10% ethyl acetate.

(b) Five or more extractions are carried out, until the drained solvent appears colorless. Each extraction takes 20 minutes at the boiling point of the solvent, approximately 180°deg.F. The ratio of solvent to meal is about 2.5:1 on a weight basis.

(c) Each extraction is followed by a 1:1 wash with clean solvent.

(d) After extraction the flour is completely freed from all traces of solvent by drying in hot air, or by vacuum (with or without the aid of "steam strippling").

The fish flour produced by this process has a light brown colour and is free from the effects of heating. It is neutral and, in particular, is absolutely free from all fishy or other foreign odours.

The material obtained by acetone extraction of the final product (after acid hydrolysis) does not exceed 0.7% by weight and the moisture content of the flour varies between 2 and 3%.

The biological value of the protein in the raw material is not impaired by this process, and the resultant fish flour is therefore eminently suitable for the enrichment of bread and maize meal.

Fish flour is being manufactured to the above specification on behalf of the whole fish meal industry in the Union and in South West Africa under the auspices of the South African Fish Meal Producers' Association in a pilot plant near Cape Town.

Tenders have now been invited from manufacturers all over the world for a full-scale solvent extraction plant to produce from 4,000 to 5,000 tons of fish flour per annum.

(Fisheries Newsletter, Vol. 16, No. 4, April, 1957, p. 29).

GENERAL FISHERY NEWS

(i) Committee for Oceanography

The Government of India having accepted the recommendation of the Special Committee constituted by the Central Board of Geophysics have decided to set up a 'Committee for Oceanography' under the Central Board of Geophysics in place of the existing Standing Committee on Oceanography. The Committee will consist of the following members:

1. The Principal Scientific Officer (Navy), Naval Headquarters, Ministry of Defence, New Delhi.

2. The Chief Hydrographer, Naval Hydrographic Office, Ministry of Defence, Dehra Dun.

3. The Chief Research Officer, Central Marine Fisheries Research Station, Ministry of Food & Agriculture, S. India.

4. The Head of the Geophysics Department, Andhra University, Waltair.

5. Dr. K. S. Krishnan, Director, National Physical Laboratory, Hillside Road, New Delhi.

6. The Director-General of Observatories, India Meteorological Department, New Delhi or his representative.

7. The Secretary, Central Board of Geophysics, Calcutta (Convenor).

The Committee for Oceanography shall advise the Central Board of Geophysics on matters pertaining to oceanography referred to it from time to time, and in formulating plans and programmes of work for the Oceanographic Research Wing of the Central Board of Geophysics.

The Committee shall have power to co-opt additional members as and when necessary.

(Ministry of Scientific Research & Cultural Affairs, Govt. of India, New Delhi).

(ii) Indo-Pacific Fisheries Council.

India will participate in the 8th Session of the Indo-Pacific Fisheries Council to be held in Colombo, Ceylon from December 6 to 22, 1958. Development of inland and marine fisheries in the Indo-Pacific region will be the main subject for discussion.

Set up in 1949, the Council formulates schemes of development and utilisation of fisheries resources in the Indo-Pacific region and coordinates research in fisheries.

India's fisheries schemes and projects relating to researches on Mackerel and Hilsa are expected to receive an impetus through the work proposed to be done at the Colombo Session of the Council.

Dr. B. S. Bhimachar, Chief Research Officer of Central Inland Fisheries Research Station, who will represent India, will ask the Council to hold biennial, instead of annual session.

(iii) Central Fisheries Technological Research Station.

The CFTRS was established in August, 1957 and is already functioning at Cochin (Kerala State).

It undertakes investigations on the various aspects of fishing technology namely, study and designing of nets and other gear likely to prove suitable to our waters, both inshore and off-shore, investigations on materials for the making of twines nets etc., suitable materials for tanning and preserving of net and different kinds of anti-fouling compositions for boats and vessels; and training of fishermen and others in improved methods and techniques of boat construction.

A processing wing has been added to the Technological station with effect from September 4, 1958, and the following research investigations are proposed to be carried out in this wing.

1. Investigations on the processing of fish.

2. Investigations on utilisation of fish products, such as fish oils, guano, fish meal, etc. utilisation of sea weeds and other marine products.

3. Evolving of commodity standards and grades for various fishing products and basis for a system of fish inspection to ensure good quality of fish and fish products for sale in the markets.

There is a provision of Rs. 20.30 lakhs for this under the second Five Year Plan.

(iv) The following Officers have been appointed in the Ministry of Food & Agriculture.

Mr. K. N. Das, appointed as Deputy Director (Fisheries Extension), will coordinate the activities of the Central Fisheries Extension Units in different parts of the Country.

Mr. M. P. Devasundaram appointed as Deputy Director (Fish Marketing) to take up work of survey of existing fish marketing methods, organisation of

marketing of fish and fisheries products and execution of pilot fish marketing projects.

Mr. R. Venkataraman, Assistant Director (Processing) will act as counterpart assistant to the FAO Expert (Processing), and assist him in the establishment of processing section of the Central Fisheries Technological Station and also will undertake research in improved processing techniques.

Mr. Rajat Roy Choudhuri, Junior Naval Architect will guide and supervise the designing and construction of fishing boats.

APPENDIX I

State —Grow More Food Schemes—Fisheries—Targets and Achievements—for Quarter Ending SEPT. / DEC. — YEAR / MAR. / JUNE.

(For schemes jointly financed by Govt. of India and State Government)*

of Additional fish production in Tons

S. No.	Name of Scheme	Units of Work		Productive Potential in terms of Additional fish production in Tons.		Remarks
		Target	Achievement	Target	Achievement	
I.	*DIRECT PRODUCTIVE SCHEMES.*					
1.	Supply of Fishery requisites.					
	(a) boats . .					
	(b) Yarn . .					
	(c) timber . .					
	(d) sail cloth . .					
	(e) hooks . .					
	(f) any other item (specify)					
2.	Mechanisation of indigenous crafts.					
	(a) engines . .					
	(b) Mech. boats . .					
3.	Fish Farming . .					
	(a) stocking . .					
	(b) Fishing . .					
	(c) Reclamation . .					
4.	Other Schemes . .					

II *SCHEMES AUGMENTING PRODUCTION INDIRECTLY.*

| | | |

APPENDIX II

Grow More Food Schemes—Fisheries—Expenditure for the quarter ending 19

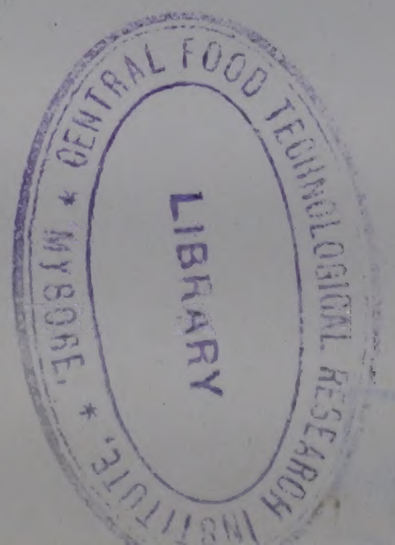
(For schemes jointly financed by Govt. of India and State Govt.)*

(In Rupees)

S. No.	Name of the Scheme	Total cost sanctioned for the entire duration of the scheme	SANCTIONED EXPENDITURE						ACTUAL EXPENDITURE.						Remarks
			Central Govts. Share			State Govts. Share			Central Govts. Share			State Govts. Share			
			Loan	Grant	Total	Loan	Grant	Total	Loan	Grant	Total	Loan	Grant	Total	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	I. *DIRECT PRODUCTIVE SCHEMES.*														
1.	Supply of fishery requisites .														
	(a) boats . .														
	(b) yarn . .														
	(c) timber . . .														
	(d) sail Cloth . .														
	(e) hooks . . .														
	(f) any other item (specify) .														
2.	Mechanisation of Indigenous craft.														
	(a) engines . . .														
	(b) Mech. boats. . .														
3.	Fish Farming . . .														
	(a) stocking . . .														
	(b) Fishing . . .														
	(c) Reclamation . . .														
4.	Other schemes . . .														
	II. *SCHEMES AUGMENTING PRODUCTION INDIRECTLY.*														
1	Supply of salt at subsidised rates for fish curing . .														

(a) salt issued	
(b) fish brought in for cure	
(c) Fish let out after cure	
2. Improvement of Fish-curing yards.	
3. Intensive Survey.	
(a) Cultivable waters	
(b) Spawn and fry collection centres	
(c) Fishery resources	
4. Quick Transport facilities	
5. Other Schemes	
TOTAL	

*This proforma is also intended for the schemes exclusively financed by the State Government but they may be distinguished by an asterisk.



GMGIPND—NS—193 M of F & A—29-5-59—400.

R. I. LIBRARY, MY

CHECKED
2.5.97

CHECKED
2008

VERIFIED
2013

CFTRI-MYSORE
4198
Indian fisheries.

COVER DESIGNED & PRINTED BY THE MANAGER, GOVERNMENT OF INDIA PHOTO-LITHO PRESS, NEW DELHI.